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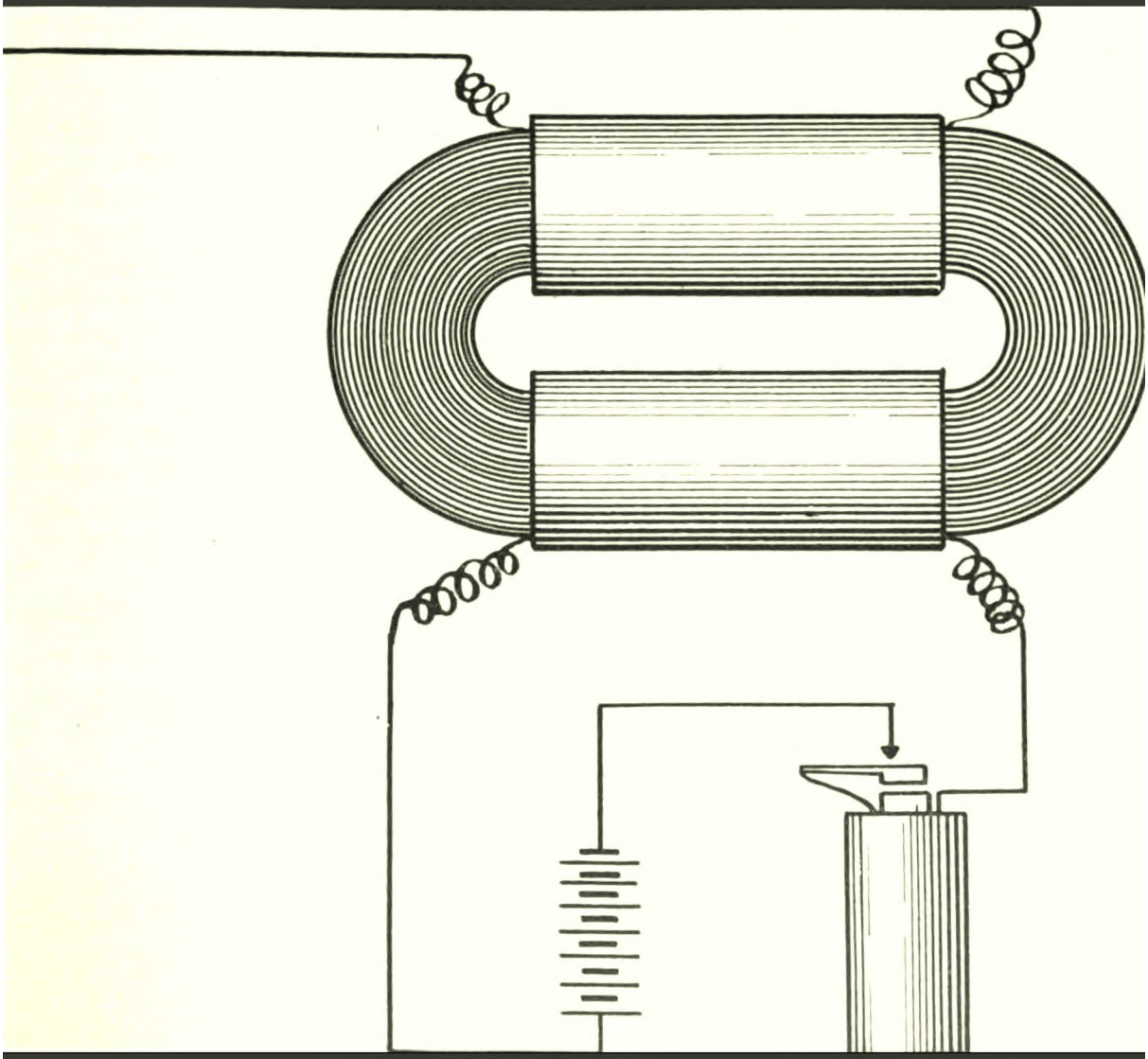

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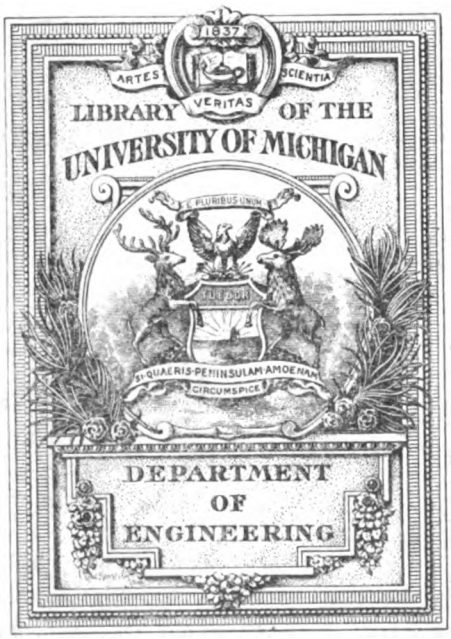

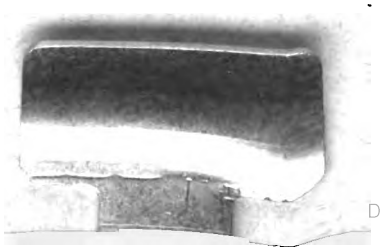

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Telephone Magazine

AN ILLUSTRATED MONTHLY MAGAZINE

VOLUME XVII

JANUARY TO JUNE, 1901

EDITED BY

W. J. BUCKLEY AND A. J. KUSEL

PUBLISHED BY

ELECTRICAL ENGINEERING PUBLISHING CO.

MARQUETTE BUILDING, CHICAGO

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PRESS OF
THE HENRY O. SHEPARD COMPANY
212-214 MONROE STREET
CHICAGO

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VOL. XVII. CHICAGO, JANUARY, 1901. NO. 112

TELEPHONE SWITCHBOARDS.

BY H. P. CLAUSEN.

(*Continued.*)

To every one accustomed to the designing of telephone circuits, the problem of designing a supervisory system for central battery equipments without introducing either a ground at the subscriber's station, a third contact to the plug, a retardation coil permanently connected to earth from one of the line circuits, or a socket switch for the plugs, is like the old catch problem of designing a combination of circuits for a telephone station equipment (using local batteries) and having but one upper contact to the switch hook. In other words, the designing of a supervisory system calls for the use of one or more of the above elements.

In order to get at the question a little more definitely, let it be taken for granted that the subscriber's station equipment shall not be provided with a ground connection, either normally while in the unused condition or while being used during a conversation. The signal receiving equipment of a subscriber's station being connected in combination with a condenser in any desired manner, we have only to consider the conditions imposed by having no ground at the subscriber's station. Now, in order to attain a supervisory system, we can use either retardation coils connected to the subscriber's jack from the ground together with the plug socket switches, or a third contact on the plug or jack. In case, however, a ground is permitted at the subscriber's station while in its unused condition, double retardation coils or repeating coils may be used in producing a supervisory system.

However, referring to Fig. 10, the first diagram shows a combination of circuits in which the subscriber's telephone station is not provided with a ground connection, either normally or temporarily. By referring to the cord circuit, it will be observed that the A P and C P plugs are connected by means of the wires W, W′, W″ and W‴, while the battery B is connected to the tip and sleeve circuits thru the retardation coils R and R′. The retardation coils, it will be observed, are so constructed that when the current passes thru them an armature A will be attracted. Connected to the armature is the battery B′, a spring S′ of the socket switch S and resting against it the back contact X O which then connects to the lamp L and contact K. The plug A P normally resting in the socket switch S keeps the spring S′ away from the X O contact, thus preventing a flow of current from the battery B thru the lamp L. Upon the receipt of a call, however, the operator would remove the A P plug from the socket switch and thus result in lighting the lamp L by virtue of the S′ spring making contact with X O. Upon examining the subscriber's station equipment it will be observed that with the switch hook in its downward position no flow of current would take place thru the relays, as the condenser connected in series with the signal receiver would prevent such a flow. The moment, however, that the subscriber responds in removing his hand telephone from the switch hook it results in projecting current over the circuit and at the same

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time in attracting the armature A of the relay R and R' and thus extinguishing the lamp L. After the connected parties have completed their conversation they would, of course, indicate this fact by replacing their telephone receivers to the switch hook, and the moment that both subscribers performed this act the relays R and R' would lose current and release the armature A, which would again cause a lighting of the lamp L. The operator upon perceiving this signal would then withdraw the plugs from the line jacks and upon reseating them, cause the S' spring to leave contact at X O, which would again extinguish the lamps and produce the normally unlighted condition.

This system, however, possesses an objectionable feature in the respect that both subscribers must hang up before a switchboard operator proceeded to clear the connection. In other words, if, after two subscribers had been connected together, and after completing their conversation one of them failed to replace the telephone to the switch hook, it would result in tying up the other subscriber's circuit in such a way that unless the operator happened to listen in on the circuit the remaining subscriber would be completely isolated from the exchange, as far as signaling or obtaining attention is concerned.

In order to overcome to a certain extent the objectionable features of this system, the second diagram shows a method by which both subscribers may signal the operator independently after having been connected together; that is, any failure on the part of the called party to restore his telephone receiver to the switch hook would not result in preventing the caller from signaling the operator.

Referring to the diagram, we have the same retardation coils R and R', together with the wires W and battery B. Both the answering and calling plug are provided with the socket switch S. The connections of the socket switch, together with its lamp battery, and armature A remain similar to that shown in the first diagram. However, on tracing out the circuits beginning at the cord side of the retardation coil R', we have the coil C connected to the sleeve S and across the coil we have a non-inductive resistance NINK. The operation of this circuit is as follows: On picking up the answering plug it causes a lighting of the lamp L, and after the plug A P is inserted into the caller's line jack, current flowing thru the relay C results in drawing up its armature and extinguishing the lamp L. Then upon picking up the calling plug and placing it into the called-for subscriber's line jack, the armature C' is not attracted until the called-for subscriber responds to a signal which the operator might project over the circuit by any of the well-known methods. After a connection has been established, one or more of the subscribers placing their receivers to the switch hook would result in dropping the armature connected to their C relays and thus cause the lamp L to burn; this lamp, as was described before, remaining in its lighted condition until the socket switch S be operated by placing the plug into its seat.

While a system constructed on the lines of the second diagram will operate very successfully under favorable conditions, chiefly in a laboratory, it has not been very generally adopted. The third diagram, however, shows a plan which has seen considerable service and may, therefore, be regarded as a successful method when viewed from a manager's standpoint.

In a general way the operation of this system is similar to that of the system shown by the first diagram and it possesses all of the disadvantageous features common to normally resting contacts and plug socket switches, for every one familiar with such apparatus endeavors to steer clear of using them whenever it is possible to devise suitable substitutes.

Referring to the fourth diagram, a method is shown by which both the resting contact and plug socket switch is eliminated; but in doing this, it is necessary to provide a ground at the subscriber's station while in its unused condition. Upon examining the diagram it will be observed that we have

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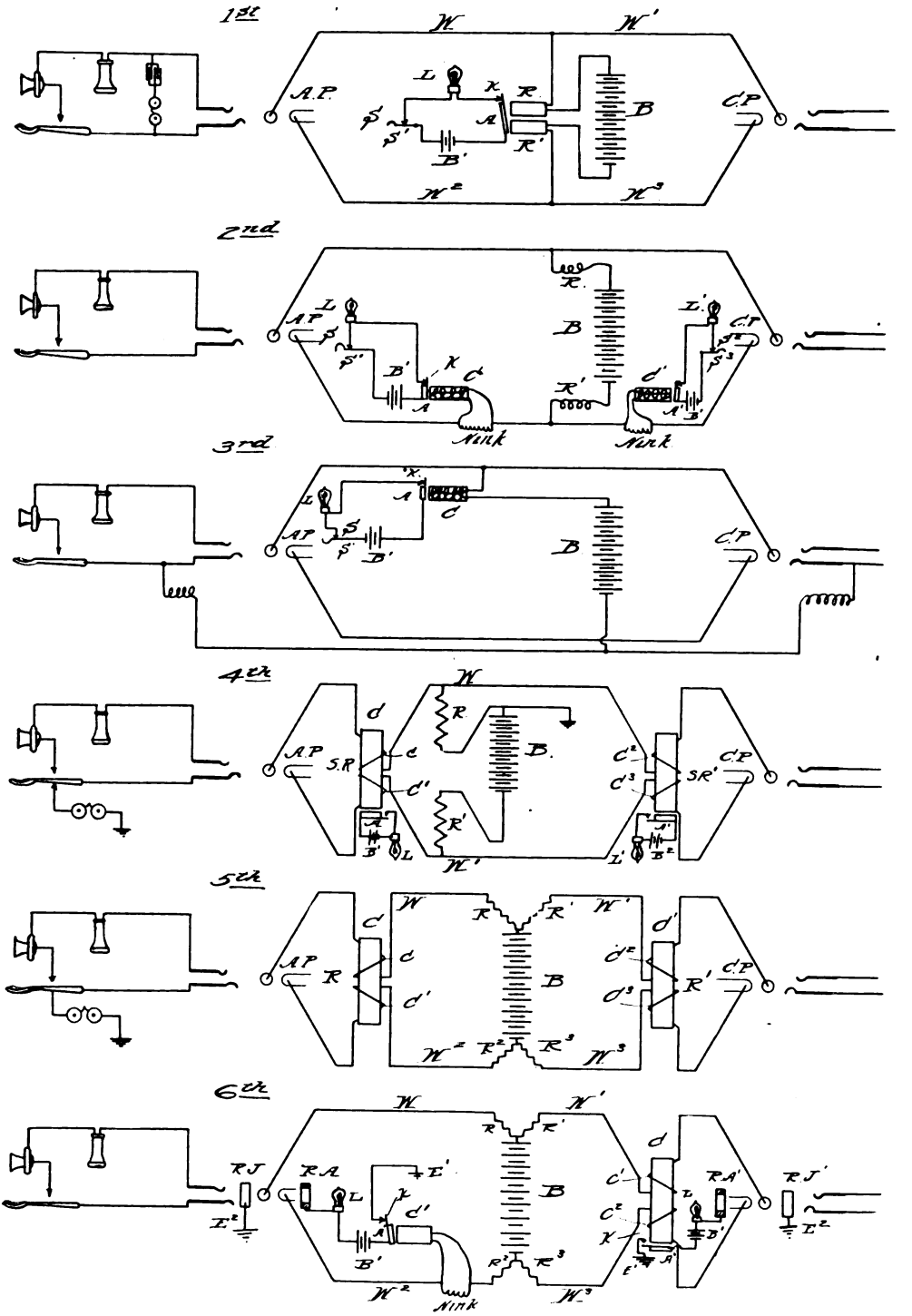

FIG. 10.

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the battery B and retardation coils R and R′ connected to the wires W and to the plugs P thru the coils C of the supervisory relays S R. The operation of this system is as follows: The operator upon responding to a call would place the A P plug into the line jacks, this resulting in passing current from the battery B to the telephone, thru the two windings C and C′ of the relay S R. In view of the fact, however, that the C windings are so placed upon the core of the relay, a flow of current thru both coils causes no effective magnetism to be present in the relay, and therefore producing no action upon the armature A. Upon placing the calling plug in the called-for subscriber's line jack, there would not be a flow of current thru both of the C coils, as the subscriber's station equipment (as regards the line circuit) is in an open condition, but by reason of the signal receiver being normally connected to ground and the battery also being grounded on one side, as shown, there will be a flow of current thru the C‴ winding only, of the relay S R′ and consequently an attraction of the armature A′, this resulting in lighting the lamp L′. Now, then, upon the called-for subscriber responding, the ground is removed at his station and current passed thru the C″ winding of the relay, resulting in neutralizing the magnetism acting upon the armature A′ and causing said magnet to release the armature, which would then result in extinguishing the lamp. Upon either one or both of the subscribers desiring to attract the operator's attention a momentary reëstablishing of the ground connection would result in again lighting the lamp. The operation of this system of supervisory signals has proved to be a success, the only change in this design consisting in the substitution of a repeating coil for the relays R and R′, as shown by the fifth diagram.

On first thought it might appear as tho the presence of electromagnets in the talking circuit would prove detrimental to the service, but this is not the case, owing to the fact that the C relays being wound non-inductively they present no retarding influence to the passage of telephonic currents, more than that caused by the mere addition of their ohmic resistance.

In case the presence of a ground at the subscriber's station proves a bar to its being used, as also the provision of a plug socket switch, a system shown in the sixth diagram may be applied. As shown, the battery B connects to the cord circuits thru the repeating coil R. We again have the series connected relay C, but the plugs, as also the line jacks, are provided with a third connector. The connector on the line jack goes to ground, while the connector on the plug connects to the lamp and from there thru the battery B′ to the armature A, contact K and ground E′. Normally, therefore, the lamp L does not burn. The operation of this system is as follows: Upon placing the answering plug into the caller's line jack, the relay C gets current and draws up its armature A, opening the contact K, while the contact R A, of the plug, lies in touch with the contact R J of the jack. Upon the operator placing the calling plug into the called-for subscriber's line jack (imagine that the answering plug is transposed into a calling plug) the same connections are made, but inasmuch as there is no current flowing thru the relay coil C, the armature A is not attracted and the lamp L lights up and remains lighted until the armature A is attracted, which takes place upon the called-for subscriber responding. On the right half of the sixth diagram, we have shown a supervisory relay equipped with a non-inductive winding, this construction permitting of the same cord circuit being used in connection with systems shown by the third, fourth and fifth diagrams.

THE ERIE COMPANY.

The Erie Company operates in New York, Ohio, Minnesota, Michigan and Wisconsin. It has 106,500 subscribers. Its capital stock is $8,000,000, with the privilege of isuing $7,000,000 more. Its bonded debt consists of $1,000,000 six per cents and $9,000,000 five per cents. The principal office is at Lowell, Massachusetts.

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THE TELEGRAPHONE; A MAGNETIC SPEECH-RECORDER.

BY VALDEMAR POULSEN.

The following is a description of the principles and the arrangement of my invention, which I have called the telegraphone. A steel wire (piano wire) A B, about 1.5m. (5 feet) long and 0.5mm. (1-50 inch) in diameter is stretched on a board (Fig. 1). Along

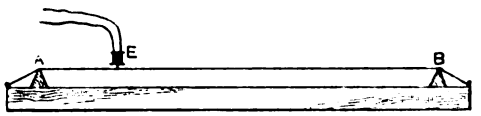

FIG. 1.

it can slide the electromagnet E, which embraces it with one of the poles (Fig. 2). The core of the electromagnet is a piece of soft iron wire about 8mm. (⅓ inch) long and 0.75mm. (3-100 inch) in diameter, and the electromagnet itself is in series with a battery and a microphone, or is connected to a transformer in the microphone circuit. At the beginning of an experiment the wire should be completely demagnetized.

If, while the electromagnet is sliding along the wire with a velocity of about

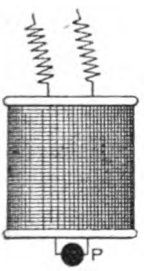

FIG. 2.

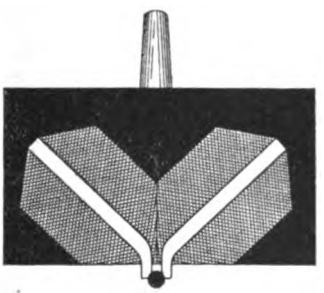

FIG. 3.

1m. per second, the microphone is spoken into, the current fluctuations produced register themselves by means of the electromagnet on the steel wire. If now the electromagnet is connected up with a telephone and made to travel over the wire again, the telephone repeats what was spoken into the microphone. Thus, owing to the great coercive strength of steel there has been impressed on the wire in undulations, so to speak, of magnetization, a kind of writing which is permanent, and faithfully records the articulation of the voice. When E is put, now, in direct connection with a moderately strong battery and is made to pass once more over the wire the magnetic writing is obliterated under the influence of the constant magnetizing force, which is great compared with the intensity of the writing magnetic forces.

The wire A B is too short to contain many words. In order to obtain a larger capacity a very long piano wire is wound very firmly round a drum having a fine spiral groove on its surface, and the piano wire follows this spiral groove. Parallel with the axis of the drum there is a rod upon which a kind of sleeve can slide. The electromagnet is fastened to this sleeve. When the apparatus is in operation, the electromagnet embraces with one of its poles, or with both, the steel wire (Fig. 3), and during the rotation this steel wire itself pushes the electromagnet and the sleeve along the rod. It is very easy to handle a drum of this kind, and the whole arrangement is very convenient for experiments. Of course, it must be borne in mind that in the various telephonic and telegraphic applications of the telegraphonic principle there are certain conditions which must be fulfilled. The nature, dimensions and cost of the writing basis, and the velocity, the construction of the electromagnet and the magnitude of the current must all be considered. Without going into details here I only beg to direct the attention upon some essential points concerning the three proceedings, namely, the inscription, the reproduction and the obliteration.

Most frequently the inscription is effected by means of a polarized electromagnet; but the polarization and the degree of the polarization must not be arbitrary. Let, for instance, the electromagnet, by means of which the writing is to be performed, obliterate a prior magnetic record and also simultaneously magnetize the writing basis. Then during the inscription the electromagnet is given the polarization opposed to that which it had during the obliterа-

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tion. In this way a lively movement of the molecular magnets is obtained at the very moment of forming the writing. The susceptibility seems to increase very much in that magnetic *status nascendi*, and every shade of the writing becomes extremely perceptible. Ordinarily the polarization of the writing magnet is only a very small fraction of that of the obliterating one. The

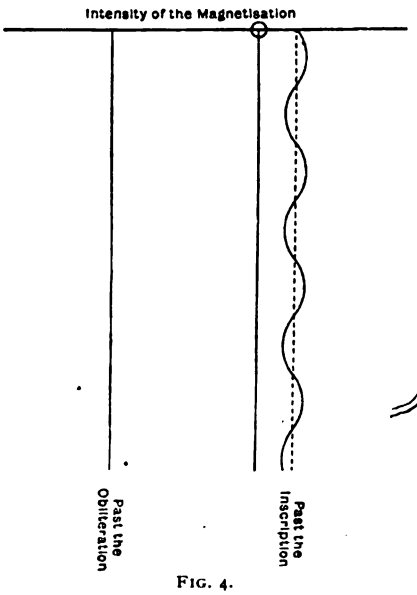

FIG. 4.

nearer its polarization approaches to the neutralization of that of the writing basis, however, the feebler may be, of course, the polarization of the obliterating magnet. The coercive force determines the degree of polarization which exactly neutralizes the magnetization of the writing basis. It is found that the writing is somewhat weak when the polarization of the electromagnet during the process of inscription is just equal to that used in the preceding obliteration. In order to polarize the electromagnet a constant current or a permanent magnet may be used.

If the positive and negative curves of an alternating current differ, their faculty of producing the writing may equally differ. This explains the peculiarity that the direction of the primary current with a certain polarization of the writing basis may sometimes influence the writing which, in the secondary circuit, is performed by an unpolarized electromagnet. This is owing to the lack of uniformity in the manner in which the resistance of the microphone is increasing and diminishing. The inequality here spoken of is, perhaps, the more considerable the more the mobility of the carbon granules is considered.

It seems that a speech (or a song) inscribed on the wire may be reproduced indefinitely without any perceptible diminution in clearness, the tone of the voice remaining perfectly distinct. Even when the apparatus is as primi-

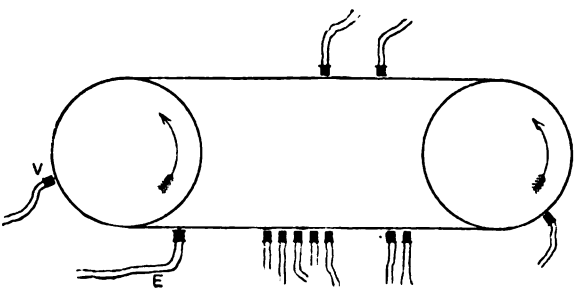

FIG. 5.

tive as that of Fig. 1, the reproduced voice is distinguished by the highest clearness and purity, and free from disturbing accompanying noises. The telegraphones of more recent date are able to reproduce with the greatest exactitude not only words spoken or sung into the microphone, but also whispers and even the feeble sounds of respiration.

The writing is completely obliterated by passage thru a magnetic field of sufficient strength. Ordinarily it is sufficient to let the writing basis pass the writing magnet or another small electromagnet energized by a current from two or three cells. If a speech, however, be inscribed by means of an unpolarized magnet on a writing basis already written upon, there results, as a rule, not an obliteration, but an interference.

Besides common piano wires, steel ribbons and nickel wires have been used as writing bases. The dimensions

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of the steel ribbons were 3mm. by 0.105mm. (1-9 inch by 1-50 inch). The steel ribbon passes from a roll to a second receiving roll, where the layers of the ribbon may cover each other without the writing being destroyed. As to this last point, it has been proved by experience that the magnetism does traverse the ribbon, tho as a rule there is sufficient air space between consecutive layers to afford nearly complete protection. With a speed of about 1m. (3 feet) per second, 0.154 liter (1-50 cubic feet) of steel is needed for a speech lasting an hour. Instead of ribbon, a fine piano wire unrolling from one place to another may be used. In some cases nickel may with perfectly good effect be used as a writing basis, which fact is in accordance with the known properties of this metal as regards permanence for weak magnetizations, and demonstrated by A. Abt. The great dependence on mechanical influences which is characteristic of the magnetic state of nickel demands, however, careful handling of the nickel wire. It is not likely that the common steel used hitherto is exactly the most suitable for telegraphonic purposes; most probably other and better kinds are to be found.

I have no intention of speaking of all the various specifically phonographic applications of the telegraphonic principle, nor of the constructive differences in connection with such applications. Nevertheless, I think that the following arrangement ought to be sketched: A long steel ribbon is stretched between two rolls which can rotate at a rather considerable speed. The ribbon passes a series of electromagnets at a speed regulated according to the circumstances. The electromagnet E inscribes words, music, etc., the other electromagnets — "the reading magnets" — reproduce the communications in the telephone of each hearer; and, finally, the obliterating magnet V equalizes the magnetic variations of the ribbon ("telephonic newspaper," Fig. 5). As using does not weaken the writing, we are able to intercalate any number of reading magnets.

Again, it is possible to use the telegraphone to increase the telephonic current (telephonic relay). The engineer, E. S. Hagemann, has proposed an arrangement which, theoretically, at least, is very simple; and which I here describe. A drum is provided with a series of circular steel rings having their centers in the axis of the drum, their planes perpendicular to the axis. As the drum rotates, whatever is spoken into the microphone is inscribed on the first ring by means of a writing magnet. By means of a series of reading magnets placed on the first ring, the words are transmitted to the other

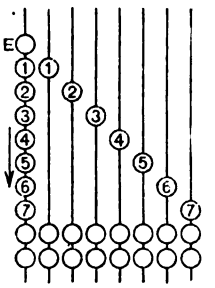

FIG. 6.

rings, which synchronically carry their equally formed magnets past their reading magnets, duly connected together and afterward past obliterating magnets (Fig. 6).

An elegant method of compensation has been invented by the engineer, P. O. Pedersen, and allows several speeches to be intermingled, so that they can afterward be reproduced separately. As it is not feasible to describe this method satisfactorily in a few words, I shall not speak further of it here. Later, perhaps, Mr. Pederson himself will make a communication about it.

In my endeavors to develop the telegraphone I have received the greatest assistance — first from Mr. P. D. Pedersen, and also from Mr. E. S. Hagemann. I owe them both my best thanks. I have, besides, to thank the Institution and experts abroad, as well as those of my own country, for the interest they have shown in the telegraphone.

VALDEMAR POULSEN.

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TELEGRAPHS AND TELEPHONES AT THE PARIS EXHIBITION.

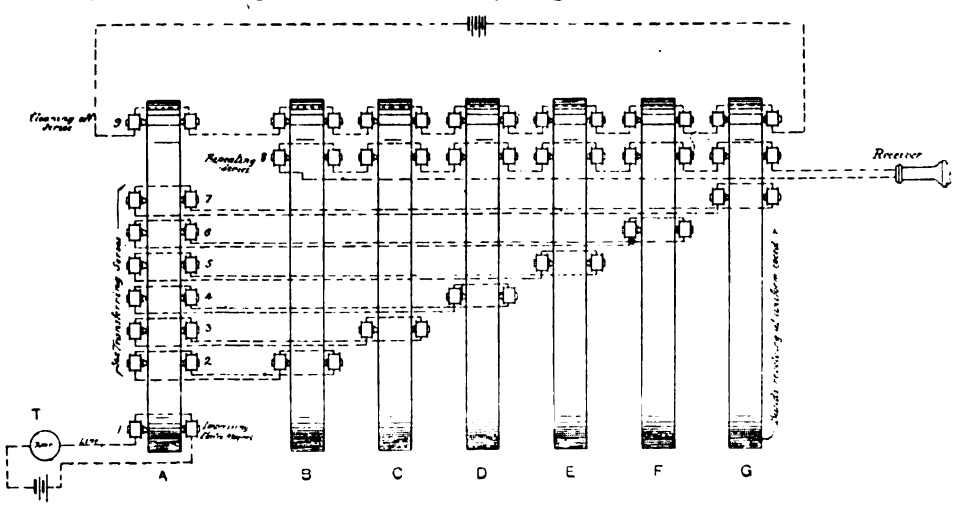
In reading his paper on "Telegraphs and Telephones at the Paris Exhibition," last week, Mr. Gavey sketched the figure below on the blackboard, and added the following explanation with regard to the possibility of applying the principle of the Poulsen microphone to the development of a telephonic repeater:

"As illustrating a method which is thought might be developed into a satisfactory telephone repeater, the following was suggested as a groundwork to be built upon. Assuming, as illustrated in the figure, that there are six or more endless steel bands, A, B, C, D, etc., revolving at an absolutely uniform rate round suitable pulley wheels, and that, approaching closely to the band A are the poles of an electromagnet 1 connected to a telephone T; that a little further on an electromagnet 2 is mounted in a similar manner, but connected to a corresponding magnet on band B, and beyond this an electromagnet 3 establishes a relation between bands A and C, and so on, next the bands B, C, D, E, F are fitted with a number of electromagnets 8, joined up in series and connected to the line over which it is desired to transmit, and finally a series of electromagnets thru which a permanent current circulates are fixed at point 9.

"Then, on starting the apparatus, and speaking into the telephone T, band A is energized by the series of transverse magnetic polarities due to the variable currents in the electromagnet. As the band in its revolution passes under magnet 2 it generates currents which are transmitted to its corresponding electromagnet on band B, there to repeat the magnetic effect. The same action takes place between electromagnet 3 and band C, and so on until the whole of the independent bands are each impressed with the same magnetic alphabet. On completing half of the revolution the bands B, C, D, E, F pass under and energize the series of electromagnets which are joined up in such a manner as to combine the electromotive forces due to each separate band, and lastly the series of electromagnets 9 wipes out the whole record, and leaves the bands free to be acted on by fresh impressions."

DISCUSSION ON MR. GAVEY'S PAPER.

Sir William Preece, K. C. B., who opened the discussion, said it did his heart good to see such a crowded assembly to listen to an address which had telegraphy principally for its text. His mind could not help going back to the early stages of the history of the Institution, when sensation after sensation was brought before them; when the room itself was filled to overflowing, and applauses, ringing as cheerfully as that which had just been given to Mr. Gavey, were the order of the day. If young members of the Institution took



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the trouble to read the earlier volumes of the *Proceedings* they would find there a great deal that is interesting; they would find there a good deal to learn and a great many facts which would save them from a good many troubles. This was not the first time that a paper had been read in that room detailing the exhibits at different exhibitions. He had had the gratification himself, on more than one occasion, of bringing before the Institution things shown in Paris, Chicago, Philadelphia, Munich and Vienna, and he hoped and trusted that the practice originating with the very early days of the Institution would be continued, and that every possible advantage would be taken to find out how progress was going on in other countries. He would not say that we were behindhand, but if we did not look out we should be getting behind. Twenty-three years had elapsed since the telephone had first been introduced into England (at Plymouth and at the Institution), and where were we now? Was the telephone industry in this country in a flourishing or in a proper position? A kind of triangular duel was going on. On the one hand there was a company striving hard and doing its best to maintain a very difficult position. There were municipalities springing up and trying to emulate their would-be competitor, and there was in the background a small department called the Postoffice doing its very utmost to meet the wants of the public, and this latter had the very great advantage over every one of its competitors, namely, that its back was broad enough to bear the greatest possible abuse that could be brought against it. He envied the position of Mexico. Mr. Gavey had mentioned that there everybody might start his own exchange and be placed in communication where he liked and with whom he pleased on condition that there was complete intercommunication. But how was free intercommunication possible if every competitor had his own switch and transmitter and instrument? The difficulty was bad enough with three competitors, but what would it be in these circumstances? If there was a business in this world that ought to be manipulated and managed by one administration and by one concern, and conducted on one principle, it was the business of telephony. He had hoped that he would see the day when every house in this country should have its own telephone, and that there would be a practicable and easy mode of placing every house in communication with every other house in the United Kingdom. Well, this was thrown to the winds with a great many other wild illusions and wild imaginations. It might come in the distant future, but he was afraid, with gray hairs coming so rapidly, that he would never see his ideal telephone system carried out. Mr. Gavey had mentioned something about the exhibits of wireless telegraphy. Well, we were getting tired of wireless telegraphy. The papers were still advertising strange experiments in different places but we wanted to see practical wireless telegraphy. Where was there at present a single circuit worked commercially on a practical system of wireless telegraphy? If there was, let somebody come forward and read a paper on it before the Institution. The most beautiful thing and greatest novelty in the paper was the microphonograph of Mr. Poulsen's. Unfortunately, there was very great difficulty in showing this in operation. He had tried to see it in Paris but the instrument had been sent to Berlin. Nevertheless, it was one of those things that was going to open the eyes of all our physicists, scientists and theoretical men on the question of the molecular character of all magnetic and electric operations. This continual exchange of energy thru electrical connections, thru diaphragms and steel and circuits performed by this beautiful instrument of Mr. Poulsen's was marvelous. Mr. Gavey had referred to the decision of the Electrical Congress to recommend the adoption of the two units, one the C. G. S. unit of magnetic field and the other the C. G. S. unit of magnetic flux; but he had not mentioned that these units were to be called "Gauss" and "Maxwell," respectively. He personally had serious doubts whether the

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name Maxwell would come into practical use. Probably the abbreviation into the word "Max" might come into use; and he had little doubt that writers would take up the unit of field and call it "Gauss," and thus this would rapidly come into general use. He was proud to see his successor in the technical chair at the Postoffice bring this subject before the meeting with the clearness with which he had.

Mr. W. J. Hammer called attention to the fact that the inventor of what Mr. Gavey called the "microphonograph" strongly objected to this title, and desired it to be known as the "telephonograph." He had seen this instrument in Berlin, and some interesting modifications of it, and he could certainly endorse what Sir William Preece and Mr. Gavey had said about its useful simplicity and perfection. He had had considerable experience in connection with similar instruments, and had certainly never come across anything in the shape of speaking instruments to approach this one. With other instruments, in which the sound waves are recorded by something in the way of a style, there was bound to be a scratching noise that could not be eliminated, but the way the magnetic lines of force were stored up in Mr. Poulsen's invention enabled the sounds to be reproduced in the most perfect manner. He himself had made experiments with it by using words which were very difficult for the best of phonographs to give out, and whispering, and things of that kind, and the results made him very certain in his statement that it was superior to anything that had ever been made in the way of a talking machine. He concluded by adding a tribute to the beautiful and satisfactory working of the Pollak-Virag wireless telegraphy in its present form. He had seen the working of the system, and had some samples of the writing obtained from it.

Mr. M. F. Roberts said that reticence on the part of exhibitors at the exhibition to give full information with regard to their exhibits was one of the many difficulties he, as well as Mr. Gavey, had met with in Paris. He found in many cases that the attendants in charge of the stands either had not the necessary knowledge to explain the exhibits or else had been definitely instructed not to explain them. This difficulty was added to by the want of a suitable catalog. He had been told by different gentlemen who had sent men specially over to Paris that in many cases the visits were practically useless, simply because they could not obtain the information they wanted. With one or two exceptions, he thought they might say that the improvements pointed out by Mr. Gavey were improvements in points of detail, and he would have been particularly interested had Mr. Gavey extended his remarks and made reference to the progress made between different exhibitions, briefly referring to what had been the most marked improvements since 1878. To his mind it appeared that the improvements in the case of telegraphs very largely consisted of a higher finish and improvement in the apparatus exhibited, whereas in telephony the improvements appeared to be very largely in the simplification of parts and the design of parts which could be readily produced at cheap rates. Of course, it was possible to extend the development in the case of telephony taking this line, because there was such an enormous multiplication of the reproduction of the same parts, whereas in telegraphy the problem that had to be dealt with varied very considerably in almost every case. Not only, too, did it vary in the case of a given line but it varied for different times of the day. The standardization, or successful design of parts for telephone working, appeared to be largely due to specialization by certain firms. For example, in the case of one of the exhibits Mr. Gavey had described, this firm had one gentleman at the exhibition who had made a special study of switchboards, another who had made a special study of instruments, and a third whose department was to give information with respect to dynamos. Now they could easily understand where a powerful firm had representatives and employes who devoted their attention especially to one part,

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that we did get the improvements which Mr. Gavey called attention to in the case of the central battery system of working, and he thought it was this specializing in America which had resulted in the very great progress to be noticed in the American exhibits at the exhibition. Mr. Gavey had also called attention to the Rowland telegraph apparatus, and at every other Paris Exhibition he believed there was a typewriting instrument, but it was an astonishing fact that typewriting machines had made such little headway in this country. He hoped that the very successful exhibit by the Rowland's Company would have one effect, namely, to popularize the use of the typewriting telegraph in this country.

Mr. A. W. Heaviside, in a communication which was read by the secretary, asked for more, his motive being that a subject so deeply interesting as electrical applications in any form needed much detail to be of any practical utility. So far as he knew, tho much experience had been gained in the use of the Delaney multiplex system, the valuable electrical data relating thereto had not been published to the world. For instance, it would be extremely useful if the profession were fully acquainted with actual time lag under practical conditions, with given conductors of both copper and iron, and with an impressed E. M. F. of a given value, the effect of leakage at the insulators, and the practical difficulties experienced in a variable climate like ours. Similarly, in the case of Rowland's multiplex, he asked, did abrupt omission of two half-waves produce any deleterious reaction from the electrostatic discharge? The operator's control of the receiving roll by means of a transverse mark appeared to be weak. The receiving roll, if feasible, should be automatically controlled. The advantage that the receiving messages were delivered from the receiving instrument in a condition to be sent out for delivery was no mean one if it really saved a corresponding number of operators. Mercardier's system of superimposed vibrations at the sending end and selective apparatus at the receiving end he thought most suggestive. If 24 superimposed vibrations could be sent simultaneously, and each receiving apparatus could be tuned to respond only to that which belonged to it, then why not have a main pair of conductors of considerable cross section with 24 loops of variable lengths at 24 different stations? Of course, metallic loops must be used, and this revived a nineteen-year-old suggestion of his for working the Wheatstone bridge, which was probably worth trial. Anything that had for its object the reduction in the number of wires and stability of signaling was worthy of much thought. He thought Pollak and Virag's photoautographic telegraph apparatus marvelously clever, but apparently wanting in simplicity at present. That it might become commercially applicable every one desired, and to throw cold water upon it would be as bad as calling a telephone a philosophical toy. He suggested that in this, as in all the systems described in the paper, it would be useful to append a theoretical diagram illustrating the principle of each case. It must be remembered that there were many student members of the Institution, and life was too short for every individual member to look up all the authorities. It was a case of *Science Abstracts* over again. Central battery telephone switches were on their trial, and if the extensions from the simple subscriber's circuit — from the telephone to the central exchange — could be adapted to the many diverse needs the telephone had to meet, it had probably come to stay. It was to be hoped that the new decade would see such a development of the telephone in Great Britain and Ireland as would remove the reproach we suffered from of being behindhand as compared with other countries. One feature of the central battery system, if he rightly understood it, was that it secured privacy of communication between the users, a feature that had distinguished the Newcastle-on-Tyne exchange for many years, and which commended itself to all. In the matter of microphones, he said the question of how to get loud speaking without jarring had

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been a problem since the days of Hughes, and still remained a problem. An ideal microphone should respond in identically the same manner from day to day, give every vibration with great delicacy, and invariably recover itself without lag or jar. If carbon filaments for microphones could be manufactured with similar qualities as those possessed by horsehair when used for domestic furniture, an ideal microphone might result. He had experimented with carbon filaments, and had obtained the most beautiful speech, but their brittleness occasioned short life. Perhaps makers of incandescent lamps could solve the problem. In regard to Poulsen's microphonograph, one could only admire and wonder what next.

Mr. Dane Sinclair was inclined to think Mr. Gavey was too enthusiastic on the common battery or central energy system of telephone exchange. With regard to the invention in connection with the phonograph that Mr. Gavey had called the 'microphonograph,' and another gentleman preferred to call the 'telephonograph' he thought the latter was the more accurate description, but in justice to Mr. Gavey the name he had given to it was the one by which it was known generally. In this connection, too, he was glad to say that for once he had been ahead of his good friend, Sir William Preece. When he was in the exhibition he got the instrument set to work for him under all the conditions he could possibly ask for, and it seemed marvelously pretty and marvelously wonderful. There was no doubt, as both Mr. Gavey and others had said, that it gave a distinct record of speech not to be compared with any hitherto. If, in addition, this invention gave, as Mr. Gavey had suggested it might, a telephone relay, then it passed at once out of the beautiful scientific interest into the happy interest of something that was going to be of commercial value and of commercial importance to users of the telephone. Under Sir William Preece's directions very heavy copper wire had been erected from one end of this island to the other, but if we were going to have a telephonic relay this heavy copper wire, weighing 800 pounds to the mile, became no longer necessary, and, of course, as the price of the conductor went down the user would reap the advantage. He believed there were large possibilities, indeed, in the future from this instrument, and he had been rather disappointed at the time he was examining it to find that the electrical press in London were not speaking of it, in a way that it quite deserved.

Mr. J. E. Kingsbury, speaking of Mr. Poulsen's instrument, said that while credit was given to Professor Bell for a very bold idea in expecting to put on an electrical wire electrical undulations to represent sound waves, this invention was hardly less bold. As a scientific instrument we were bound to give it first place, and to regard it as a grand application of a very clever idea, but it was, of course, a little too soon to remark upon the practical uses which might lie in store for it. He, personally, thought that there were no conditions of the telephone service known to practical telephonists which the common battery system, described that evening, and shown at the Paris Exhibition, did not meet. Mr. Sinclair ought to have expressed his views to the contrary a little more strongly, and given reasons for them. Coming to the question of a telephone repeater, he reminded Mr. Gavey that, while, perhaps, the question might have been raised more specifically twelve years ago, still it was of very early origin. The first patent was taken out in 1879, when there was no million dollars reward, and it was a curious thing that when there was no such inducement there was a prolific supply, but now there was a big reward offered there was nothing good to be found. The idea was to take a telephone diaphragm as a receiving instrument and make it a combination instrument, attaching to it a microphone transmitter. This seemed to have the germ of a good and satisfactory telephone relay or repeater, but altho it had been before the public for twenty years, it did not seem to have been developed to any practical stage.

Professor Silvanus P. Thompson,

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referring to the new magnetic units with which the Paris Congress had endowed us, was not quite sure that the name "Maxwell" was destined to receive the same immediate use as "Gauss," because it was a synonym of a name we had before, namely, one magnetic line, and it was just as easy to say one million lines as one million "Maxwells." Indeed, it is rather easier to say "megaline" than "megamaxwell," and he did not think it would displace the word "line." He had had an opportunity of inspecting the system of wireless telegraphy devised by Mr. Slaby and Count Arco, not only in the Paris Exhibition, but also in Berlin, where he had witnessed its working between Berlin and Oberweide, a distance of seven or eight miles, and he did not think that Mr. Gavey's diagram quite conveyed exactly what the arrangement of the invention was. The vertical thing, that reminded one of a German sausage, really represented a wire cage, if it could be called a cage, made of either six or eight wires about 100 feet or 150 feet long, joined to a ring about 6 feet across at the top, and another ring 6 feet across at the bottom, hung from a tall chimney or something of that kind. It was a remarkable thing that it was possible to send wireless messages from one of these cages to the other when the tops of the cages, as well as the bottom, were earthed. That which seemed to be the one thing on which emphasis had hitherto been laid in wireless telegraphy, namely, that there should be an elevated and insulated conductor, did not follow in this case. This conductor might be elevated — it certainly was not insulated—yet, nevertheless, the signals were transmitted with absolute certainty. Lastly, he also bore testimony to that extraordinary perfection of regulation of the recording and speaking phonograph and telephone of Mr. Poulsen's, which he had had an opportunity of seeing in Paris. It was not then called the "microphonograph," it was not called the "microtelephone," and it was not called the "telephonograph"; it was then called the "telegraphone."

Mr. J. Gavey, who then replied, dealt first of all with Mr. Robert's request for more definite particulars of the improvements which have taken place in telegraphy and telephony between 1878 and the present day. He had, he said, rather inclined to make the paper suggestive than to state too definitely what he thought the improvements were, but in answer to this request he would just say that altho between 1878 and the present time the improvements in telegraphy had not been so marked, he certainly thought that what had been seen at the Paris Exhibition pointed to very marked improvements in our methods of telegraphy in the immediate future. At the present time we had in England and America our good old servant the Morse system, which had rendered invaluable service thruout the whole world, but which he could not help thinking was not quite up to modern requirements. He was rather looking for improvement in the direction of transmitting messages by some simple method such as the typewriting key, which would either transmit direct as in the Rowland's, or which would perforate slips — as had been designed by a couple of other inventors — that would be passed thru an automatic transmitter at a high rate of speed and that would admit either of the typing or the writing out of the messages in ordinary characters, thus putting an end to the old necessity of transcribing, and not entail the messy operation of sticking down each slip on a sheet of paper. In making this remark he said he wished it to be understood that he did not in the slightest degree belittle the lovely instrument devised by Professor Hughes, but he thought everyone would admit that an instrument which would either print or write — he did not care which — a message in such a form that it could be immediately sent out, would be far away in advance of anything we had yet met, and he ventured to prophesy that we were within measurable distance of seeing an instrument of this type introduced. Mr. Robert's remark that improvements in telephony had been mostly in detail was quite true, and when they came to think of it there

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was nothing else possible. They must have an instrument into which they could speak and hear by, and there must be lines and such apparatus by which one subscriber could be readily switched thru to another. Given these, all other improvements must be improvements in detail, and he ventured to think that all the improvements which had been made in telephonic work within the last four or five years had almost amounted to a revolution. With reference to the suggestion that a more extended description might have been given in the paper, he was afraid it would have been no gratification to them had he extended the paper to the length which would have been necessary to do this. Professor Thompson had referred to the sausage-like poles in the Slaby-D'Arco diagram. This was copied almost exactly from a pamphlet which was given to him by the exhibitors in the exhibition, and which was supposed to describe the system accurately.

A hearty vote of thanks to Mr. Gavey concluded the discussion.

INDUCTION OR ETHER WAVES?

When, in July, 1883, Steinheil made his accidental discovery that the earth could be used as a return circuit to operate a telegraph line, he undoubtedly discovered the fundamental principle of wireless telephony and telegraphy, but to Edward Davy belongs the credit of being the first in the field of wireless telegraphy and telephony. Then, following in close order, came such men as Morse, E. and H. Highton, Haworth, Mower, O'Shaunnessy. These men were the pioneers, and it is in the results of their experiments that such men as Hertz, Preece, Lodge, Smith, Marconi and Tesla interested themselves.

There are a number of others who have experimented successfully and to whom belong some credit of bringing us nearer to the goal of perfection.

It was in 1877 that Professor Pierce discovered the use of the telephone in wireless transmission of intelligence. While the telephone has always been known to be susceptible to induction and stray waves of current, it was not until 1887 that any practical use was made of the telephone in wireless transmission. But in the latter part of that year Dr. Lodge applied the telephone to wireless signaling. Then came Hertz's discovery of the relation of light and electricity, and if Hertz had lived we would today be further ahead than what we are. But after the discovery made by Hertz the world's greatest electricians started to bring about the results that we have attained. The question arises, Is wireless telephony due to induction, or is it caused by waves which, when projected into space, seek out their own opposite terminals?

A. J. KUSEL.

SAN FRANCISCO TAKES FIRST STEP TOWARD MUNICIPAL EXCHANGE.

The Supervisors' Judiciary Committee has reported in favor of accepting a grant of the option of the People's Mutual Telephone Company's franchise without the payment of any consideration, the city reserving to itself all rights over the franchise. The city attorney, however, will first determine the legality of such a grant, as he had advised that the clause in the agreement providing for the payment of $1 would necessitate the submission of the proposition to the people to be voted on.

C. L. Crittenden, president of the People's Mutual Telephone Company, said he was willing that the city should take the option as a gift.

"There is no question of the validity of the franchise," said Crittenden, "and several attorneys employed by proposed purchasers of the company's bonds have so reported. We have contracts with 7,000 firms and corporations now that will pay us $360,000 per year. It will be a great advantage to the city to buy the option and will not prevent the municipality from building another telephone system if it so desires. It is for the best interests of the city that we offer this option. The franchise was granted in November, 1896, and a syndicate is prepared to take up all the bonds irrespective of whether the city buys the option or not. We are willing for the city to reserve all its rights and privileges and desire that the city should

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ultimately get the system for a public utility. We give you an opportunity to acquire the plant and it may some day enable the city to purchase the Bell Telephone Company for a very low rate, as we intend to run it a close race in business."

MORE ABOUT NORTHERN PACIFIC RAILWAY 'PHONES.

The Northern Pacific Railway Company has begun building a long-distance and division system to take the place of its telegraph lines as far as practicable, and the extent to which it is practicable means almost everywhere along the main line and the branches. General Manager Kendrick is more than convinced that most of the communication which is now done by the telegraph can be as well, if not better, performed by the telephone. Each and every station on the different divisions is to be brought into direct communication with the division offices, and all the multitudinous messages that are now slowly ticked off by the Morse alphabet will be delivered *viva voce*. This means an immense saving in time, and time is money in the railroad business.

The Northern Pacific is not acting on impulse. Railroad presidents and general managers and such people never act on impulse. Mr. Kendrick for a long time has been revolving the project in his mind, and has long been convinced of the feasibility and desirability of the change. More than a year and a half ago he took the matter up seriously, intending to make the change then, but for some reason decided to postpone action for a little while. In the meanwhile some of the Eastern roads kindly tested his theories for him. The Baltimore & Ohio, the Lake Shore and the Boston & Maine each put a few telephones into service and found them thoroly satisfactory. The New York, New Haven & Hartford did the same on a somewhat larger scale, and has now decided to extend the service. But on none of these lines is the telephone service anything more than supplementary to the antiquated telegraph. The West keeps up its reputation for hustle, and so the Northern Pacific is going to make no half-way change, but a radical one. The system will be similar to that now in use so far as it has been worked out.

When the general offices in St. Paul want to communicate with Tacoma, they will do as they usually do now; send the message or messages to Dickenson, thence to Spokane and thence to Tacoma, so as not to interfere too much with local business.

The same measures will be taken, also, to insure accuracy in the transmission of train orders and other messages in which accuracy is the prime element. These messages will be telephoned from a written order and will be taken down in writing at the receiving end, with the usual carbon copies and subject to the same rules as to corrections and erasures that now hold in regard to telegrams. Then they will be repeated word for word, so as to leave no room for error. Hence, tho the telephone, as used in everyday life, has been known to repeat things that were never said, there will be as little danger of mistake in the Northern Pacific service, and perhaps less, than there is today with the telegraph.

The substitution will be made gradually, and it may be a year before the last telegraph instrument ceases clicking.

TELEPHONE SYSTEM BUILDS FACTORY.

The Michigan Telephone Company will establish a factory in Detroit to manufacture telephone apparatus, including switchboards, transmitters, receivers, etc. The new shops will commence business January 1, employing at the start about two hundred men and increasing the force until, it is said, several times that number will be employed. They will make telephone apparatus for the exchanges in all parts of Michigan. Besides the new Detroit factory a similar institution will be started by the Erie system in Pennsylvania. The object is to make in both factories all the various kinds of telephone apparatus that the company has been obliged to buy heretofore.

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SUBMARINE TELEPHONE.

An interesting test of submarine telephony was made at Louisville on November 14. Captain Lorcher, standing up underneath ten feet of water in the Ohio river at Evansville, conversed with parties in Louisville, among whom were some well-known telephone people. The test was made over the long-distance instrument, the captain using his own submarine instrument, which he claims is operated under pressure of four pounds to the square inch. It was with great difficulty the reporter could make himself heard, but the words of the captain were plainly audible. He conversed with the men on the surface in charge of the air-pumps and was as easily understood as though standing by their sides.

FOR FILLING METAL CABLE BUSHING.

Many mechanics will have their patience sorely tried when pouring melted lead around a damp or wet joint to find it explode, blow out or scatter from the effects of steam generated by the heat of the lead. The whole trouble may be stopped by putting a piece of resin the size of a man's thumb into the ladle and allowing it to melt before pouring.

A HUMANE HEADBAND.

How to do away with the headband of your switchboard. There is nothing on a switchboard that needs greater improvement than an operator's receiver, but it seems as if the manufacturers have neglected it, for up to the present time there has been but little change in the headband since it was first introduced. It is true they are made lighter in weight, but improvement seems to have stopped at that item.

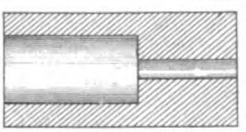

FIG. 1.

If the reader ever wore a headband forten hours the device herein shown would be appreciated.

First secure a block of wood about three inches square and 6 inches long. Now bore a hole about 4 inches deep with an expansion bit, set at the same size as the outside of a good double

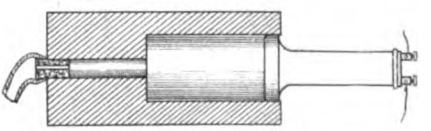

FIG. 2.

pole receiver. Now bore another hole about a half inch in diameter, as in Fig. 1. Next set a receiver in the larger opening, the receiver to fit snugly, as shown in Fig. 2.

Now secure a phonograph ear tube and insert the rubber tube in the smaller hole by means of the cork terminal thru which a hole has been bored as shown in Fig. 2.

The rubber tube should be fully 3 feet long, and when the block containing the receiver is fastened to the side of the switchboard and connected up, the operator is able to hear just as clearly as before and is relieved of the entire weight of the headband.

You may also sandpaper the interior of the block so there will be no rough places to retard vibration. The results depend largely on the parts fitting closely, and it will be well to glue all parts.

ANOTHER METHOD FOR PRESERVING POLES.

In setting telegraph and telephone poles remove the earth around the poles 2 or 3 inches from the poles and about 3 inches deep, and pour a gallon of tar oil around it, so that the pole is tarred just above and just below the surface of the ground, and then put back the earth. In southern California the earth is dug from around the poles to the depth of a foot, and about two gallons crude oil having been poured in and allowed to settle and soak, the earth is put back again and tamped. In some localities the Bell Telephone and Western Union Companies, using large round poles, dig narrow channels from 2 to 3 feet deep around the poles and fill the channels with rock salt for surface preservation.

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Telephone Magazine

THE ONLY INDEPENDENT TELEPHONE PAPER IN THE WORLD.

MARQUETTE BUILDING,

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JOHN C. McMYNN, PRESIDENT.

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One year, United States and Canada..... $1.00
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CHICAGO, JANUARY 1, 1901.

AS THE bright particular nation of the earth we have achieved much in 1900. Politically we have foozled silver and wet-nursed an empire, squally and uncertain in its habits, but still an empire. But at almost the last minute we have done something that will mark an epoch in the world's history. Capital and labor have taken each other by the hand, not by the neck, and held a big national conference in New York. The employer and the employed, representing millions of dollars and millions of men, have discovered that "the public" does not necessarily consist of a lot of inoffensive people who are neither organized workmen or organized capitalists, but that they, the employer and the employed, are the public, and that the dividing line between them is not a line but a part of themselves called in history and editorials the "public weal," for which they are jointly responsible.

THE year 1901 will be preëminently a telephone year. Looking back thru 1900 and noting how rapidly has been the advancement of Independent Telephony, we have no hesitancy in saying that 1901 will be the banner year in the Independent telephone business, and with the closing of 1901 we will see an Independent exchange in every city in the United States of any importance. And we can feel assured that when an Independent company commences to do business the monopoly is broken. One of the few truthful statements that the Bell Company utters is the one it tells the city council when it is about to grant a franchise to an Independent company. It tells the council and the public that two companies are no good to a city, and the truth of their statement lies in the fact that the Independent companies differ from the monopoly in that they give good service, honest rates and fair treatment to the public. This has been the fundamental foundation which has made them successful in 1900 and will make them doubly so in 1901. For the new year will see a perfect organization of the Independent companies that will bring toll-line connection from coast to coast, from New York to Florida, and with honest methods and the plans that have been so successful in the cities of St. Louis, Cleveland, Detroit and others too numerous to list, we will have no trouble in operating an Independent exchange in such cities as New York, Chicago, Philadelphia, and, in fact, all the leading cities of the world.

INDEPENDENT manufacturers have given to the markets of the world a perfection in telephonic devices that is enlarging civilization and changing the habits and customs of the commercial world.

There are 5,670 operating Independ-

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ent exchanges in this country, representing an investment of $90,000,000.

There are seven hundred manufacturers employing $38,000,000 supplying the demand.

Telephone labor is scarce. With one exception it has been too busy and too well paid to quarrel with the boss.

That bad good thing, the "trust," did not postulate. The only trusts are the combination of exchanges formed for the betterment and extension of service.

Wireless telephony has toddled its infant steps.

Our continental friends promise that wireless signaling will span the oceans.

The handwriting on the wall shows the commercial displacement of the telegraph by the 'phone.

The telegraphone is a reality.

Capital seeks a telephone proposition.

The demand is big and prices good.

We say again that 1901 will be a great year for the Independent telephone industry.

IN the fight for a municipal exchange for the city of Toronto, the Bell Telephone Company, operating the present exchange, stated that the city of Stockholm owns a telephone system as does also the Christiania Telephone Company, which is a monopoly, and that they are neither making money nor are they giving a satisfactory service. Telephones are plentiful in Sweden. The Swede seems to take naturally to love and telephones. Not that the two always go together, but the capacity to talk and to love seems a characteristic of the Swedish nature. Stockholm, with a population of 260,000, has 40,000 telephones, averaging one to each household. The average price is $20 per year, and the non-subscriber pays only 2½ cents per message within a radius of 43 miles. And the service is worth the money. It is not true that the city of Stockholm operates a telephone system. The International Bell Telephone Company owned the exchange in Stockholm in 1880. Its rate was $44.13. Opposition developed, and a Mr. Cedergren formed a local company. Subsequently the Government bought the Bell plant and the competition is now between the Government system and Mr. Cedergren's company. If the company does not pay, the circumstance proves nothing beyond the fact that a private corporation can not successfully compete against the Government.

It is not true that the company in Christiania is losing money. The company not only puts aside large reserves, but it provides a relief fund for employes, and still pays 5½ per cent dividends. The stock is partially owned by the municipality, and the rates vary from $16 to $22.25 per year.

If the service was not satisfactory how is it that there are more telephones in proportion to population than anywhere else in the world?

In Sweden alone there are 158 cooperative exchanges and the State owns most of the interurban lines.

Scandinavians know how to run telephone exchanges, even if owned by the State. France, Germany, Belgium, Austria and Switzerland all own most of their exchanges and toll lines. A subscriber can telephone all over Germany for 25 cents. In Austria the average rate is $21 per year; Switzerland, $18 per year. The cheapest rate is $16, given by the Grand Duchy of Luxemburg, having a population of 200,000, with free service thruout the Duchy to each subscriber. American or Canadian municipal exchanges can be made profitable. In England, local franchises are timed to expire in 1911, after which

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time the Government reserves a monopoly of the telephone. Toronto is the most American city in Canada.

It is simply a question in American politics whether any particular municipality can be trusted to operate a telephone exchange. The telephone exchange is a safe proposition, but the management thru civic politics is the unknown quantity.

THAT the telephone will totally replace the telegraph seems a certainty. Flash signaling of cable messages will soon be superseded by the wireless telephone. Any wave that will project a telegraph signal will today carry articulate speech.

Europe has experimented with wireless telephony, but America has applied the telephone in place of telegraphy in the practical sense.

The strike of the telegraphers on the Santa Fe Railway System has caused the employment of the telephone in the despatching of its trains. It has proved successful. We predict the adoption of the telephone by the Santa Fe System as well as one-half of the railway companies of this country within the year.

CHARLES P. BRUCH, general manager of the Postal Telegraph Company, New York, on being asked regarding the influence of the long-distance telephone on the business of the telegraph companies, meets existing conditions squarely and future conditions half way in replying:

"The telephone business does not materially injure the telegraph business," he said, "and, in fact, I do not see any appreciable loss in the telegraph business even where long-distance telephones are frequently used. This is due to the fact that people get into the habit of having quick service, and the result is that competition makes them use both the telephone and telegraph more frequently than they ever did before.

"The two systems operate to help each other, by educating the people to quick business methods, and I think that either system does the other more good than it does harm."

To continue the evolution of the present changing conditions, won't the education of the people to "quick service" necessarily employ the telephone to the exclusion of the slower telegraph instrument?

AT Logansport, Indiana, it has been suggested by the press of that city "that every telephone subscriber in Logansport write upon a postal card what rates he thinks would be fair and just, both to himself and the telephone company, and mail the card to some member of the citizens' telephone committee, which consists of D. C. Justice, Walter J. Uhl, G. W. Funk, M. B. Lairy, John T. Obenchain, M. F. Mahoney, Dr. Jordan, W. C. Routh and Dr. Neff. This plan will enable the committee to report to the citizens' meeting."

The scheme is luminous. All it needs to really scintillate is to have the citizens at their meeting resolve to buy the exchange at the price fixed by themselves, take forcible possession and then each citizen owner can occupy a cushioned stool with receiver in hand and comfortably and consistently fix the price of each other's wares.

THE telephone girls employed in some of the central offices of the large companies have received orders from headquarters to wear black. This seems to carry too far the principle of governing without the consent of the governed.

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When the control of men in politics and religion is undertaken, great difficulties are encountered, but these assume small stature when the tyrant man seeks to control the dress of women. Even Nero knew better, and he was what might be termed a "peach."

FOR the first time in the history of this country a strike among telephone employes has crippled the business of several of the Southern cities. It shows the telephone is now as necessary for the transaction of business as is the telegraph, or railway, or mail service. Through the spread of the strike from Houston, Texas, business in the State was paralyzed. One year ago a telephone strike would have crippled but not paralyzed the business of this community.

THE town of Mystic, Iowa, voted against granting a telephone franchise. Do they depend on mystic means for their progression? Or is it a simple and unquestioned trust reposed in a divine Providence looking after its own? However deep the mystery we hope they will come in out of the mist.

WHILE wireless telegraphy was first in the field of naval experiments, the wireless telephone, by being first in aërial experiments, is not to be outdone in military achievement. The German Government, at the suggestion of the only Kaiser, has purchased Count Zeppelin's new airship and proposes to make military experiments at Berlin. The ship is to be provided with a full equipment, including the latest devices in wireless telephony. Hoch der Kaiser!

THE last railroad to adopt the telephone is the Chicago & Alton Railway Company, which has installed a long-distance system between Chicago and Bloomington, Illinois. The first Eastern railway to adopt the telephone in place of the telegraph was the New York, New Haven & Hartford Railway, between New York and Boston. The first Western road was the Northern Pacific, followed by the Illinois Central at Omaha and New Orleans.

The telephone saves time. It eliminates mistakes. It insures absolute privacy and quick service for the officials in the connected cities.

RUSSIA is about to give up the plan of government ownership of the telephone lines and systems in the empire. This news, coming as it does without explanation, will not please the advocates of government ownership of railroads, telegraph lines and telephone systems. It need not discourage them, however. The telephone being identified more closely with individual cities than with countries as a whole, might more properly be a subject for municipal ownership than of state control. In fact, the city authorities of St. Petersburg are preparing to take over the telephone system at that place as soon as the government shall relinquish control. So instead of being a blow to government ownership, the action of Russia simply solves one of its problems and classifies the telephone.

The government has not declared its intention of giving up the ownership of the railroads of Russia, and probably will not do so. Neither will it turn the telegraph lines over to municipal or private ownership. Telegraph lines and railroads, being primarily intended to connect cities and widely separated sections, are national and not local in their scope. They lie primarily within the province of government control. Telephones, from their nature, do not, and Russia has simply discovered that fact. The experience of St. Petersburg with municipal ownership of telephones may some day be of considerable value to the cities of the United States in the way of determining whether such a plan is feasible or desirable.

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TALKS AND CROSS-TALKS.

BY A. E. DOBBS.

HINTS TO CORRESPONDENTS.

Write on one side of the paper only, and make sketch or diagram, when necessary. Endeavor to give all the facts bearing on the case, so as to enable the editor to answer intelligently.

Name and address must accompany each letter, not for publication, but for the information of the publisher.

In a story-telling match with an old-time "trouble hunter" lately, the Inspector ran across a curious case of trouble that may be of interest to some of our friends who are still using grounded circuits. Electrical engineers are, of course, well aware that certain sections of country are sometimes pretty well insulated from the rest of the earth, but they are, at times, quite puzzling for all that.

Fig. 1 shows a map of the district in question. To begin with, the exchange is located near one of the Great Lakes and, with the exception shown, there is not, and never has been, any trouble about any of its ground connections. But the bridged instruments A, B, C, were located at a rock quarry several miles from town, the ledge cropping out as shown on the map. Running over this ledge was also a stream, across which, a mile or so further down, was a dam, D. In order to obtain a good ground the linemen carried the ground wire out to the bed of the stream, driving down into the soft mud the ordinary six-foot rod. That this made a good ground was proved by the fact that the three instruments could all ring each other without difficulty; but ring the exchange they could not. Thinking that perhaps there was a break in the continuity of the stream at the dam, improbable as that might be, a return wire (G) was then run back and grounded below the dam at D. Still no result. As a final measure, the return wire was brought still further down and grounded in a swamp S, which remedied the difficulty.

Now the question is this — Why did

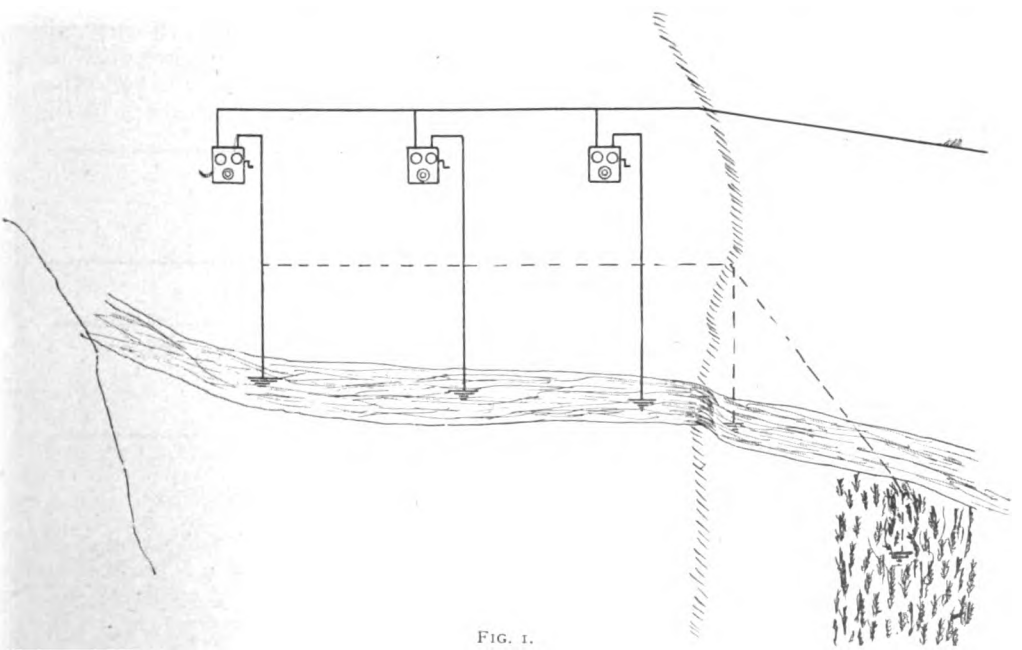

FIG. 1.

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not the stream, which flowed right by that swamp, make the connection between the swamp and the ledge? It is easy to understand that the ledge of rocks might insulate the quarry from the rest of the soil, but is it possible that the stream flowed all the way to the lake in a bed of hard pan, which absolutely insulated it from the rest of the earth? Why did not the lake into which the stream flowed complete the circuit? If any of our readers have had a similar experience, we should be glad to hear from them.

THAT SWING BRIDGE PROBLEM.

62. Will you kindly give me a diagram for crossing a turn bridge with ten lines.

A. M. G.

There was a diagram given in the May edition, which is here reproduced (Fig. 2). This diagram, however, refers

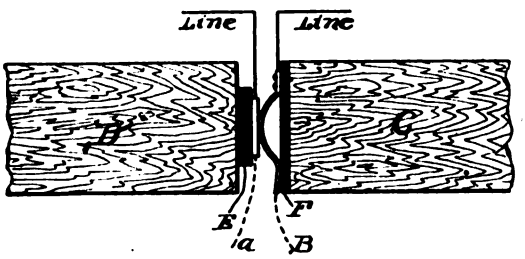

FIG. 2.

to only one line, tho it might be extended to take care of ten lines. If the Inspector was doing this work, however, he would use a rubber-covered, lead-encased cable if the circumstances would allow of it. A cable of this kind would probably not cost more than 25 cents a foot and you would have no bad contacts or interrupted conversations. Buy a 15-pair cable and use one wire of each pair for the line, and connect the other side of the same pairs to ground to avoid induction and cross-talk. This will leave you five pairs for emergencies and as long as these pairs are not in use they should also be grounded. This is on the supposition which we gather from your letter that you have grounded lines. Lay the cable in the bottom of the river, pushing it well down into the mud, and leave plenty of slack for this purpose.

Of course if the river is used for logging and contains other obstructions the strip shown in Fig. 2 may be the only thing you can use. Place the strips two feet apart. Could you not set two high poles on the river bank and so span it? A 300-foot span is practicable.

SPECIFIC INFORMATION.

We can not answer questions in regard to the merits of apparatus except in a general way. The Inspector has most decided opinions of his own in regard to certain lines of material, but in these columns every one is treated with perfect fairness as far as it is possible to do so. Every manufacturer is presumably doing the best he can, and when his goods are mentioned at all his claims should be fairly treated. This, however, does not keep us from criticizing certain tendencies which, in a general way, can be considered wrong. *This column is run for the benefit of our readers and is influenced by no other consideration,* but this does not mean that we will tell them what our private opinion may be of a certain manufacturer's telephones, as long as that manufacturer is doing a legitimate business.

AN INQUIRY ABOUT BATTERY GENERATORS.

In order to ring the ordinary telephone bell an alternating current is necessary in order to swing the bell armature from one side to the other. In Fig.

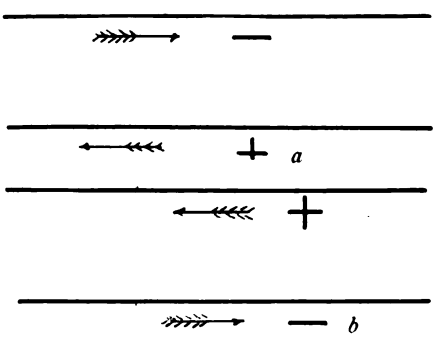

FIG. 3.

3, *a* and *b*, is shown the direction at one instant when the top line is positive and the bottom negative and a current flowing (pardon the expression), let us say,

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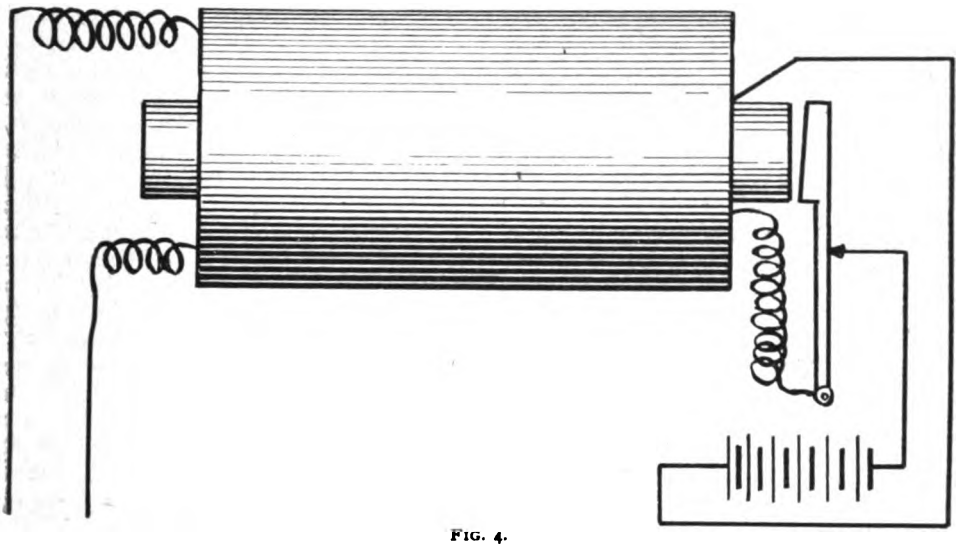

FIG. 4.

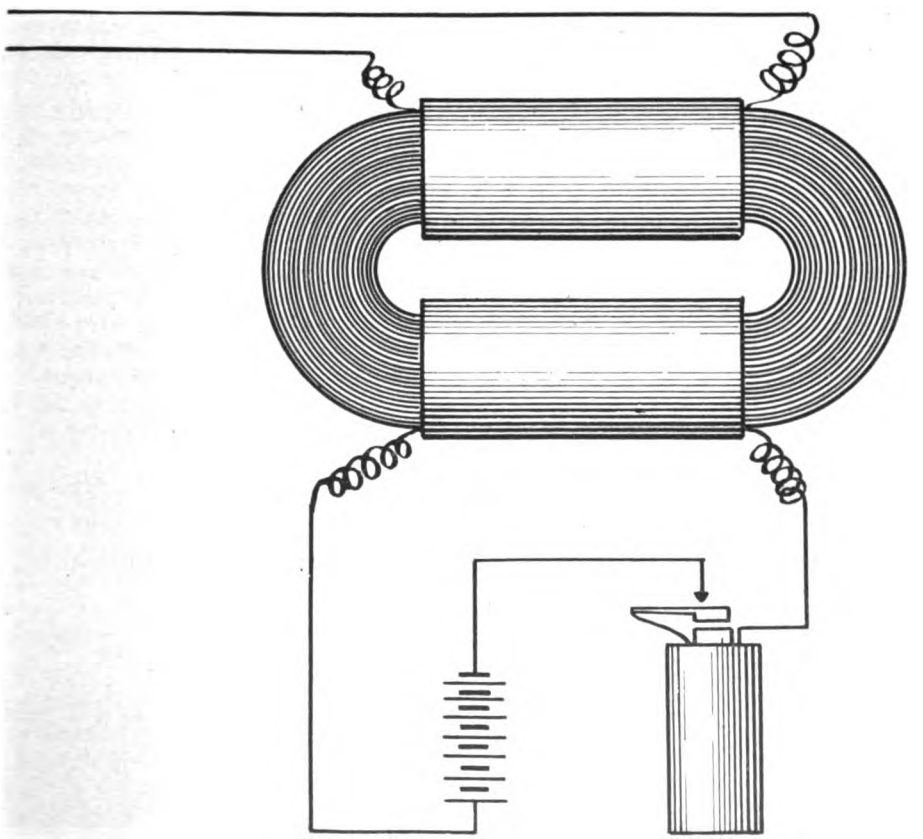

FIG. 5.

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from left to right. The next instant, however, it has become reversed, as at *b*, and the bottom wire is now the positive one and the current flowing from right to left, which, of course, reverses the magnets and swings the clapper to the other side. Now the ordinary generator armature reverses its current at every half revolution, but when we wish to use battery current for ringing these bells we must find some way to reverse these currents at the rate of several times a second. One of the simplest of these devices is shown in Fig. 4, which is an induction coil pure and simple, such as might be used in medical batteries except that it is of different proportions.

Fig. 5 is another form which is rather more efficient, the auxiliary magnet T being used only for the purpose of breaking the circuit. These coils should be from six to eight inches long, and require the use of from four to six cells, to give out a sufficient ringing current for the ordinary switchboard. The current is in the primary coil all the time; storage or gravity cells being used as a general thing for this purpose. There can, however, be a great saving of battery if the circuit could be cut, as shown by the dotted line at L, and a loop carried over to the ringing key so that the circuit would only be closed when the operator rings a subscriber.

In this case an open circuit battery could be used.

In either case this device requires a battery giving a large quantity output.

In Fig. 6 we have a pole changer, a device that has, with various modifications, been in use for many years, my own memory recalling the pendulum type in 1883. In the first place we have a magnet R, charged by a local battery L B, attracting an armature attached to a pair of swinging arms A A. It will now be noticed that the battery contacts are arranged in two different ways; first, when the armature is attracted the arms A A, which are insulated from each other by the insulating strip I, make contact at the points *c*'' and *c*''' which throws the negative side of the battery to the top arm and the positive to the bottom arm. As these arms are connected directly to the ringing circuit the current will go to line in that direction at that instant; but, no sooner does the armature make contact at the points in this way than it breaks its own local contact and is immediately pulled back by the spring S, against the contacts *c*', *c*'', which of course reverses the current.

The local battery L B is in circuit all the time to keep the armature A A going and usually consists of one or two cells of some closed circuit type. The main battery may consist of from 20 to 50 sal ammoniac or dry cells. As the main battery is never closed except in ringing, there is very little loss of current. Inductive effects are usually stronger in battery than in generator ringing, and to soften the peak of the wave, a condenser is inserted in the circuit. But to leave the condenser in cir-

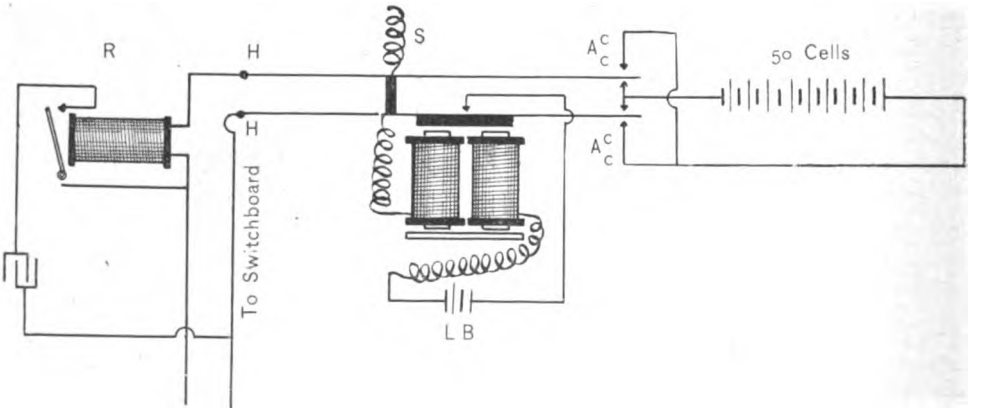

FIG. 6.

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cuit all the time would make work for the battery, which we wish to avoid, so we put in a relay R', which leaves the condenser open till the ringing circuit is closed, when the relay closes, thus cutting the condenser into circuit.

THREE OF A KIND.

63. When a series grounded and bridged metallic line is connected thru a repeating coil at the exchange, how are drops wound and arranged so that both sides can ring off? R. L. D.

The usual ring-off drops are left in circuit. Sometimes a bell is left in circuit, instead of the drops.

64. What is the resistance of one side of a repeating coil?

Anything you please; generally for toll-line work from 175 to 250 ohms.

65. Is it possible to ring thru a repeating coil?

Yes; but not thru the kind usually placed on toll lines.

DISCOVERED!

The Independent telephone movement was at one time essentially a Western product and it is not surprising that some of our Eastern friends, whose only source of information is at Cortlandt street, New York, should not know very much about it.

Recently, however, this lusty young Independent has been invading the more richly paying Eastern territory, and startled the mossbacks by his aggressiveness. The racket finally disturbed

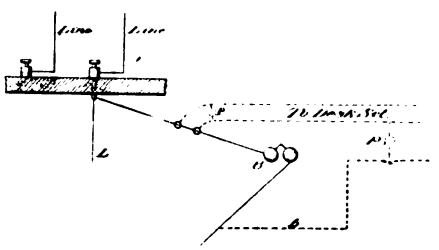

FIG. 7.

a well-known contemporary, who woke up, rubbed his eyes, and after taking a good look at the youngster, and finding him very much alive and worth getting acquainted with, edged up to him, put one arm around him, patted him on the back in a patronizing way, whispered encouragingly that he looked quite strong enough to get along without baby food, and from all appearances he might yet live and grow up to be as big as his father.

Those who have refused to subscribe for this paper on account of its pro-Bell tendencies can now take heart and subscribe.

WHO CAN ANSWER THIS?

66. DEAR SIR,—I have a trouble that has bothered me for a week and I can not seem to get at it.

We have a common-return system, not grounded, and considerable cable. Our cables are kept full metallic to the outside terminals, where one side goes to line and the other to the common-return wire. Last week we connected in a new subscriber, and when we rung in, he could not get the office, nor could the office ring him. We naturally looked for a cross in the cable, but on opening the line at the terminal it tested "clear." We also could raise the subscriber from the cable box as well as the exchange; but the minute they were connected together the line seemed to be crossed again. I have changed the telephones and done everything else I can think of, and as we have no more spare conductors in that cable, what shall I do? C. C.

Will some of our readers make a guess at this?

SPIDER WIRING ON POLES.

67. What kind of wire should I use in connecting from the cable box to the line wires? Would you recommend weatherproof wire for this purpose?

In ordinarily good weather no doubt weatherproof wire would give very good service, and in a country very dry and hot it would last longer than rubber covering. When exposed to water or dampness, however, it will absorb a great deal more of it than you might imagine, and in that case you would have some cross-talk. On the other hand, plain rubber covering should be avoided, as it is not strong mechanically and exposure to the open air soon rots it.

The best wire to use in this climate is a rubber-covered and braided No. 18 B. & S. G. single wire.

68. Please give a drawing showing how to connect up a desk 'phone with a wall 'phone to obtain the best results? A. G. A.

With ordinary instruments the best, or at least the easiest way, is to follow the plan laid down in Fig. 7. This

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shows two line binding-posts with wires leading to the inside of the instrument.

If you will look at your instrument you will see that as a general thing there are two wires leading from the right-hand binding-post. One of these, L, goes to the switch, while the other leads to the bells.

Cut the wire at the top of the box—the wire leading to the ringers, and loop your 'phone or extension bell as shown by the first two dotted lines. This will compel you to talk thru the magnets of the wall 'phone when using the desk set, which can be avoided by running a third wire on the other side of the bells and using a push-button *p*, to shunt the bells out. If preferred this third wire can be connected to the left binding-post. A push-button is generally better than a switch for this purpose, as the users will often forget to set the switch back when thru talking.

On the wall 'phone the desk set is cut out when the hook comes up; another push-button at *p*, in the desk circuit, will allow the person calling at the wall instrument to do so without disturbing the desk set.

Both bells ring when called.

69. Here we have an interesting letter from Australia asking for the best method of running telephone cables for service in a damp gold mine, 3,500 feet underground. Dampness seems to be their greatest enemy, and they would also like to know if we have any moisture-proof telephones in this country.

In a case of this kind, full metallic circuits are the only guarantee of satisfactory service, and there are three methods of wiring for places like this. In the first place, if the mine does not have more than 100 degrees of heat, a good rubber or gutta percha insulation is about as good as any and easy to transport.

The wire used should be No. 16 copper B. W. G. (No. 14 B. & S.), and uniformly coated with rubber or gutta percha, outside of which an asphaltum soaked braid is placed, after which the two are then twisted together. If this is not considered sufficient then take rubber-covered wire over which is drawn a lead sheath, which keeps water, gas and dirt away from it. This kind is used a great deal in ship wiring, and in this case it would be better to use smaller wires, say No. 20 B. W. G., using one pair of wires for each telephone, and either connect the different levels by means of an exchange above ground, or connect them all together in an intercommunicating system.

Fig. 8 shows an outlet box which can be made in a few minutes by any carpenter, and is practically as good as any the manufacturers in this country

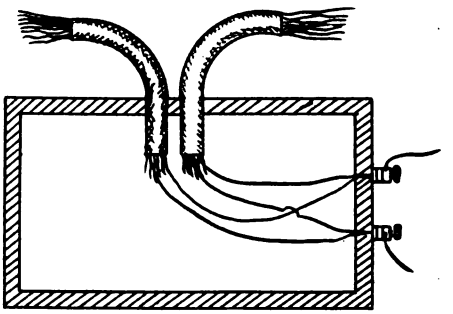

FIG. 8.

are ready to supply them if called for. In this case make a stout box of thoroly seasoned wood and as nearly water-tight as possible, the size of the box depending on the number of wires to be taken care of.

Have a screw binding-post that comes thru the wood, or make a small hole alongside the line binding-posts and push the bare wire outside and solder to the line post. Bring the two ends of the lead cable inside the box thru a hole in the side, fan out the wires and connect as shown.

Only one pair of wires are shown connected up, but any number can be duplicated. After the connections are made and soldered fill the box full of asphaltum or a mixture of resin and beeswax.

Third method: If the mine is too hot for rubber use a dry core paper cable. Connect your cable terminals to the telephone lines on the different levels.

As to moisture-proof telephones, manufacturers can supply them.

PLEASE renew my subscription for the TELEPHONE MAGAZINE; it is too valuable to be without, so send my December copy at once. J. A. S.

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THE TELEPHONE REMINISCENT.

The close of the greatest year in the development of the telephone almost involuntarily recalls the wonder of its recent origin and the interesting circumstances and incidents which surround its inception.

The Centennial Exposition, of 1876, is familiar to most of the workers of today in the telephone field, and yet it was only on February 14 of that year when Prof. Elisha Gray's caveat and Alexander Bell's application were filed in the Patent Office at Washington. It was at the Centennial that Professor Gray, then superintendent of the Western Electric Company, was exhibiting his then recently designed musical telegraph one Sunday morning in June, to a party of distinguished gentlemen, among whom was Sir William Thomson and a number of well-known scientific and moneyed men interested in the demonstration of Professor Gray's invention. Mr. Bell conceived this meeting to be an opportunity to show his speaking telephone, which he had in four months brought to a practical working condition. He wanted this chance, sought it and got it. He was at that time hard up because of taking chances, but he felt that, toy or no toy, there was surely money to be made from his carrier of sound waves, and if he could only get a hearing he would have interested the right kind of people for a big enterprise; so by fate or luck he was given the opportunity to rig up his apparatus then and there. Standing at one transmitter, he asked one of the gentlemen present to go to the other end of the hall and listen at the other transmitter, both being exactly alike, and both filling the office of receiver as well. The result awoke the greatest curiosity, and after several trials by different gentlemen, thru a strange coincidence, Sir William Thomson was by request speaking Hamlet's soliloquy to the listening ear of Professor Gray. The only words which Professor Gray said he heard, thru a crackling of sound, were, "Aye, there's the rub"; truly prophetic, for if it had not been for the "rub" against Bell, he would have realized millions of dollars from his patent.

Altho Reis had died two years before, giving and intentionally giving, as he thought, his invention of the speaking telephone to mankind, it had not caused much stir in either the scientific or financial world; in fact, while Bell believed in his invention, and worked industriously to perfect it, Professor Gray did not make a telephone until late in the following year. At that time there was a score of men in the country trying to construct a device to carry the human voice, as was shown in the Patent Office and the many reports of success and failure published by the press.

When, on that June morning, Bell and Gray shook hands and parted, neither could have suspected how often they would meet again in the courts, whose decisions meant the price of a king's ransom to either one or the other. When Professor Gray filed his caveat in the department of electricity of the Patent Office in Washington, he did not notice, nor did his lawyer, the mere incident of the chief clerk entering the payment of his fees for filing on a blotter, which happened to be the nearest thing to hand. If the chief clerk had also entered the hour of filing, millions of dollars spent in litigation would have been applied to the development and not to the contention of the device, because on that same day, and some time between the opening and closing of the office, Alexander G. Bell also paid the fees for filing an application for a patent "for the electric transmission of noises or sounds of any kind"; herein is no mention of the transmission of vocal sounds. Professor Gray, in his caveat, sought to protect "a new art of transmitting vocal sounds telegraphically." Whether the caveat was filed first or whether the application preceded the caveat are never to be absolutely known, as there is no record to show, even at this time. The effect of these two papers differ widely in a legal sense, but each being a valuable discovery, and the essence of the value being a matter of precedence in filing, the examiner could only follow the usual course of giving to each inventor the same opportunity to perfect his claims and to permit the law to im-

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partially declare the one entitled to the allowance; but this did not happen. Bell was notified in writing that his application for a patent was suspended in consequence of Professor Gray filing his caveat; later, on February 25, he was notified that this suspension, having been declared under a misapprehension of the applicant's rights, was withdrawn. These notices were both signed by C. F. Wilber, chief examiner, and the entry was formally made in the records that the application was filed earlier on February 14 than was the caveat.

The many suits resulting since that time have brought out under oath that Gray's caveat was actually filed before Bell's application, or having been filed was entered last, being at the bottom of the pile of papers which were stacked up on the desk of the examiner for entry, at the close of the day. Many sworn statements have appeared, which seem to have little or no foundation in fact, yet the Bell Company has paid as much as a half a million of dollars for the purpose, apparently, of quieting legal curiosity. However, when the action on Mr. Bell's application moved, it moved very rapidly, for eleven days later the patent was issued in accordance with his application; something very unusual at that time in the Patent Office. Since that time the Bell people must have learned much regarding the method of procedure in taking out patents, for the Berliner patent, which is the last that stands between the public and the free manufacture of the telephone, was not issued until fourteen years after the application was filed. Bell has always claimed that he has never taken advantage of Professor Gray, and that had Gray filed an application instead of a caveat, he would have been put on the same basis in the Patent Office as himself; that the two claims would have been drawn up in similar language by the examiner and that they would then have fought it out on the question of priority; that a caveat is simply a private paper, not requiring official answer. Whether Mr. Bell ever saw the caveat of Mr. Gray will never be made public, but Bell has been charged with having profited thru the reading of the written description of a speaking telephone embodied in the caveat, and that his second patent, granted on January 30 following, covered ideas described in the caveat, but Mr. Bell denies receiving any points, information or inspiration from any source except his inner consciousness and that the Ries telephone then on exhibition in the Smithsonian Institute did not embody the principle covered in his patents. What his lawyers have shown that he discovered is "the use of an undulating current to take up the sound waves in a transmitter, to transform them into electric waves, to carry them over an electric wire to a receiver which converts them back into other sound waves, which were exact reproductions of the original."

The patent of March 7, 1876, No. 174,465, and the second patent issued January 30, 1877, No. 186,787, are the two famous patents which have made more than one hundred million dollars for the people who exploited the device, the use of which they protected. Both of these patents have since expired, but their purpose has certainly been fulfilled.

To John Phillip Reis is given the honor of the invention of the telephone, twenty years before that memorable exhibition given that Sunday morning at the Centennial. He was born in 1834, near Frankfort; he was a studious boy with weak lungs and delicate health. His father, who was a successful baker, spared no means for the lad's education, and while still a youth he showed a strong inclination toward science and chemistry. When twenty years of age, he read in a copy of a French journal a description of a plan conceived by Charles Bourseul, a young French telegrapher, for the transmission of sound by "a make and break" electric current. This sound wave was not intended to convey speech, but Reis, struck with the idea, constructed an electric device, consisting of a transmitter and a receiver connected by a telegraph wire, in which "each sound wave caused a breaking and a closing of the current." The invention of young Reis did not have much bearing on the Bell patent litiga-

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tion, but it was influenced to a considerable extent by what Reis did with the apparatus after he devised it. Prof. Sylvanus P. Thompson, the great authority of England, declares that Phillip Reis was the inventor of the telephone, that it was expressly intended to transmit speech, that it did transmit speech, and that it will transmit speech if made today according to the inventor's instructions. Bell men called it a musical toy, and claimed that it produced musical pitch and no more. The ablest lawyers of this country which money could retain have shown that Reis did not aim at inventing a speaking telephone and they conceded that Bell's invention, applied to the Reis device, makes the latter a speaking telephone. The records of contemporary publications show that Reis gave public exhibit and lectures on his instrument and its principles, from 1861 to 1864, and that he originated the name "telephone" in the year 1860, and applied the name, properly, to the transmitter. From the time of Reis to the present day, the transmitter is still the important part of the telephone; it was the Reis transmitter that first conveyed sound over a wire; it was the Bell transmitter that first carried intelligent speech a practical distance; it was the Blake transmitter that gave the Bell telephone its commercial value; it was the Berliner transmitter that has given the Bell its monopoly. It was the Edison transmitter that perfected the appliances of Bell and Berliner. Reis used in his transmitter a "tympanum," or a drum like that of the ear. Gray mentions a tympanum in his caveat; Bell specifies a "stretched membrane" in his application. Professor Thompson affirms that all transmitters utilize Reis' fundamental principles.

Many of the claimants of the invention of the telephone are living today, but none have secured anywhere near the amount of money from their claims that has Mr. Bell. Edison, Blake, Berliner and Short all received fortunes from the Bell Company in consideration of their inventions, while the claims of Dolbear, Drawbaugh and McDonough were not supported by the Patent Office, hence did not receive the monetary consideration which was, perhaps, their due. Prof. Amos Dolbear made experiments in telephony contemporaneous with those of Bell; he unquestionably invented the electrostatic telephone, but he was not well enough acquainted with the Patent Office. Drawbaugh experimented in his shop at Eberly's Mills, Pennsylvania, and constructed an apparatus which did transmit speech by an undulating electric current, and showed, long before the Bell patent, that he could and did transmit speech from a table tumbler transmitter to a tin can receiver, but he was a poor mechanic with not enough money, or possibly ambition, to go to Washington with his device. James W. McDonough, a mechanic and inventor of Chicago, on April 10, 1876, applied for a patent on a "teteloge, or means of transmitting articulate sound by electricity." His application was declared to conflict, apparently, with the patent of Bell and the applications of Edison, Richmond, Dolbear, Holcombe and Gray. One of the examiners, who was the first Patent Office official to pass on the McDonough receiver, awarded him the priority, but the examiner-in-chief promptly reversed the decision, and that decision stands; yet McDonough, in June, 1875, completed an apparatus which successfully transmitted speech, but he used a Reis transmitter, which had become public property. The Patent Office, however, decided that as he employed a make-and-break current to transmit speech, instead of the undulating current described by Bell, that the office could not recognize McDonough's claim, and further, that the undulating is the only kind of current which will transmit human speech. You can talk thru a Reis transmitter into a McDonough receiver, and the United States can not hear you talk; and that decision stands.

Professor Gray is now sixty-four years of age, a resident of Highland Park, near Chicago, and an active worker in the electric field. It is a few months ago that some final patents were granted to him on his telautograph, or writing machine, which will transmit facsimile impressions on sensitized paper, for the same distance as the tele-

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graph. He is a professor in Oberlin College, where he studied in his youth, and is a kindly scholar and scientist. Professor Dolbear graduated from the Ohio Wesleyan College, at Delaware, in 1866, the same year in which he invented the "magneto electric telegraph." In 1874 he went to Tufts College as professor of physics, where he again experimented in telephony and the conversion of sound vibration into electricity. It was in September of 1876 that he actually invented a speaking telephone, and before he had completed the model for the Patent Office, he was notified that Bell's first patent had been issued in March and the second patent applied for, and it was declared that Bell had secured a patent upon the same thing.

In 1878, Bell tried to sell to Senator Don Cameron, a one-third interest in the Bell telephone for $10,000, and the shrewd senator not only asked him to leave his office, but instructed the office force to keep the "crazy inventor" out. It was late in 1878 that the Bell Telephone Company moved from New York to Boston, not altogether of its own volition, however, but more from force of circumstances, and at that time it had a gloomy and uncertain future. The assistant secretaryship was offered to a New York newspaper reporter who had generously used some of the space at his command for "write ups"; but he did not like to leave New York, and was afraid that his pay would be given him in stock, as the company did not seem to have any money. If he had accepted the position and been willing to take his pay in stock, every single share would be now worth $25,000. It is a wonderful stock that can be expanded, inflated and watered again and again, paying extra dividends, providing a surplus with tremendous expenses and still earning millions of dollars each year. There is certainly something to be said in vindication of the energy, intelligence and resourcefulness of Alexander G. Bell.

When the firm of E. S. Greeley & Co. were making Bell telephones for the Bell Company, the transmitter would not always work properly and the Bell Company did not always have money to pay their manufacturer's bills. The firm was asked to take stock in payment for the manufacture of the telephones, but as they knew all about a cash business and very little about Bell stock, it was not until Charles L. Williams, Jr., of Boston, agreed to pay the bills when due, and took his pay in stock, that the firm went ahead and manufactured the 'phones on order for the Bell Company. Mr. Williams acquired quite a little of the stock, but could not sell any of it when he wanted to at 25 cents on the dollar. Some men achieve wealth, and some acquire it, while some have it forced upon them.

Berliner is always spoken of as one of the three telephone discoverers; Bell, Berliner and Edison having that distinction. Emil Berliner, born in 1851 in Hanover, came to this country in 1870, looking for work, which he found in a German drug store in New York. One day the old druggist gave him a copy of La Cour's "Researches in Phonic Wheels." This book gave him the idea of transmitting human speech by electricity, and later in the Centennial year, when he went to Washington to clerk in a dry goods store, he devoted his time to his studies. He himself has often told how one day, when he was standing at the key of a telegraph instrument, an operator named Richards said to him, "You have to press down harder, or it may happen that the sounder at the other end will not respond well." The thought flashed thru Berliner's mind that if pressure modified the electric current by making this slight difference in the contact, a vibratory contact would transmit human speech. He at once began experimenting with a transmitter in which he used a metallic diaphragm touching screws tipped with broken lead-pencil points. He also conceived the idea of placing the transmitter in the primary of an induction coil. He got a patent for these, which proved of great value. Berliner was then the first to conceive the microphonic principle, and both the value of his services and of his patent were recognized by the Bell Company and he was ushered into the fold and properly taken care of. Altho Berliner applied for his patent in

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1877, the Bell Company, having the Blake transmitter to use, allowed the Berliner to rest, since no one else could use a Berliner transmitter under the conditions. About the time that Berliner invented his microphone, Thomas A. Edison, then thirty years of age, had for ten years past been getting out various electric patents. The Western Union Telegraph Company, attracted by his inventions, offered him a high salary for the right to examine and purchase any or all of his electric inventions. Edison, at this time, discovered that the microphone produced variations of current in the telephone much better when one or both of the wire ends, or electrodes, were made of carbon. From the universal use of carbon in transmitters since Edison's discovery, they are termed "carbon transmitters," and they form the third discovery which makes the telephone of today a practical instrument.

The Western Union at once bought Edison's transmitter, and realizing the value of the telephone and the growing power of the Bell Company, acquired Gray's rights, Gray at this time being the most conspicuous anti-Bell claimant. The result of this suit is well known. The Western Union transferred to the Bell Company all the Edison transmitter patents, the right to use induction coils in the transmitters covered by the Page patent; the short transmitter patent, which was allowed over an interference of Edison and other contemporary claimants, and four thousand shares of Bell telephone stock. The arrangement practically gave over the telephone field to the Bell Company until the expiration of existing patents. Should the Berliner patent be held effective for seventeen years from 1891, the Bell Company will have until 1908 what protection the Berliner patent may afford them. The Independent manufacturers, however, are united in their opinion that not only was the Berliner patent of 1891 held back fraudulently, but that it is invalid by reason of the expiration of Berliner's patent of 1880, which covered substantially the same principle. It is expected that the decision on the Berliner patent will be rendered in a few weeks, when will close the most interesting chapter in the history of the telephone.

With the dawn of the new century comes a review of the past. With the closing of the century we see every village equipped with the telephone system and connected by toll lines to the outside world. Undoubtedly the telephone would have been further advanced today had it first fallen into different hands. But this was not the case; it fell into the possession of a greedy monopoly, eager to grasp and use and pervert the laws of the Patent Office. They managed to hold the patents on the telephone for seventeen years. They then tried for seventeen years more, but they failed utterly in their mission. It was then that the telephone field was open for everybody, and its development has been remarkable when we consider that the telephone has only had six years of unhampered existence; for before the expiration of the Bell patents there was little incentive to improve it, as the monopoly had no competition. They did not need to benefit their service; it was good enough, so they let it be. But time went on and the patents expired, and a movement known as Independent Telephony entered the field. They have built in the short six years, 5,825 telephone exchanges, and wherever they have built an exchange they have met with success. The Bell Company concluded that they had a competitor in the field who was worthy of attention. They used all sorts of methods, some honest, some otherwise, but it made no difference which one they used, they did not succeed. Then the Bell Company tried improving their service, but as the Independents had been successful in their other battles, they were also successful in giving to the people better service than the Bell could offer. And we have seen each year bring the Independents farther above the Bell until now with the closing of 1900 they are able to compete with the Bell in all the leading cities of the world. And when we look back and see what they have accomplished in 1900, one can safely predict that they will clear the

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field in 1901, and that 1901 will go down preëminently as a telephone year. And no matter what cities they start to build exchanges in, we feel assured that the people of those cities will be satisfied with Independent service, and 1901 will see the Bell Company showing the marked effects of a hard-fought but lost battle, and before 1902 the largest company in the business will be composed of thousands of Independent companies organized together to give protection to themselves and telephone connection to the entire country.

EDWARD J. WAKEMAN.

A "TELEPHONE EAR."

Chicago girls who listen to the click in the telephone receiver for eight hours every day in the week laugh at the idea that their New York sister operators are getting a "telephone ear," or a deafness, from the constant snapping of the call signals.

"A 'telephone ear,'" said one girl who has operated a board in the central office for three years, "is the most acute one in the world, and the more noise there is in the 'phone the more trained our ears become to detect what is being said."

"There are a great number of girls in this office," said the chief operator. "I sat at a board myself for several years, and I never heard a girl complain that the sound of the 'phone affected her hearing in the least. I know it never did mine."

In speaking of the effect of the click on an operator's hearing, A. S. Hibbard, the general manager of the Chicago Telephone Company, said:

"I do not care to say that the New York people are wrong in their contentions that they have had cases of deafness due to the sound made in connecting and disconnecting the telephones, but it sounds improbable to me. We have had the signal system in Chicago for about five years. Almost every 'phone in Chicago now calls the main board without twisting a crank, and yet I have never heard of a complaint."

"In all my experience," said S. J. Larned, general superintendent of the Chicago Telephone Company, "I have never known of a single case of a telephone girl having her hearing injured in any way by her constant listening to telephone talk and telephone noises. I have known of a number of cases of girls whose voices gave out under the strain of constant talking, but ears never. In fact, I am told that constant use of the 'phone is rather apt to improve the hearing, and there are many deaf people who can not hear the man next to them, but who understand all that is said to them thru the 'phone."

"I am not of the opinion that there is any such trouble as a telephone ear," said Dr. W. E. Casselberry, professor in the Northwestern University Medical School. "I have never had a case, and, while there might be some slight trouble with the ear drum if one used the 'phone all day long, or the outer ear might become inflamed from pressure, it would hardly be right to blame the telephone for it."

NEW TELEPHONES IN CUBA.

A cablegram from London, England, states that permission has been granted the West Indies Telegraph & Telephone Cable Company to land its cables in the British West Indies. This American company was incorporated for the purpose of constructing land lines in Cuba, connecting at Havana with the Commercial Cable and at Santiago with the cable to Jamaica, thus constituting a new line to the east coast of South Africa. American and English capital is engaged in the undertaking and it is intended to break the Western Union's Cuban monopoly.

INDEPENDENTS PUSHING.

The independent telephone lines in Pennsylvania and New Jersey are gaining strength, and it is stated that before long they will establish a connection from Atlantic City to Camden, New Jersey, and eventually to Philadelphia, joining with the Keystone Company. In anticipation of the opposition, the Bell Company is strenthening and extending its systems, building new trunk lines in New Jersey and preparing for an expansion in its Philadelphia system from 14,000 to 40,000 'phones.

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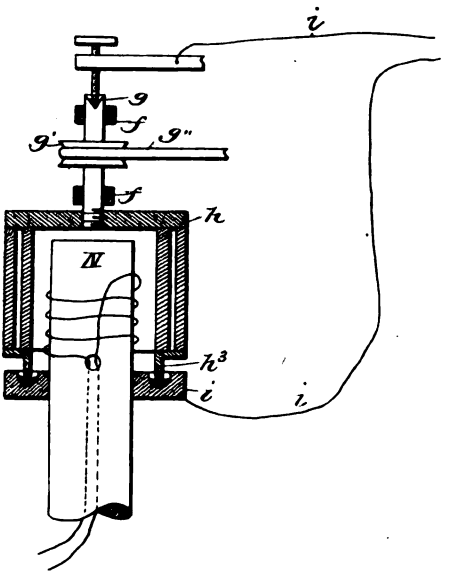
MONTHLY DIGEST OF TELEPHONE AND KINDRED PATENTS

EDITED BY EDWARD E. CLEMENT.

Copies may be had, postage paid, by enclosing 10 cents for each one. Address inquiries in care of this magazine or to McGill building, Washington, D. C.

No. 660,613.—J. B. BAKER. PROCESS OF AMPLIFYING ELECTRIC CURRENTS.

This invention is based on the use of a "unipolar" field, varied in accordance with changes in a transmitting circuit, and itself thereby producing changes in E. M. F. in a revolving conductor connected to a second or receiving circuit. If the invention were set forth in terms of the apparatus it would be called a telephonic relay, but as it is described to be a process, the patent sets forth the relay merely as apparatus that may be used to carry out his process. The principle involved is similar to that of the Faraday unipolar motor. A bar magnet, as N, in the figure, has



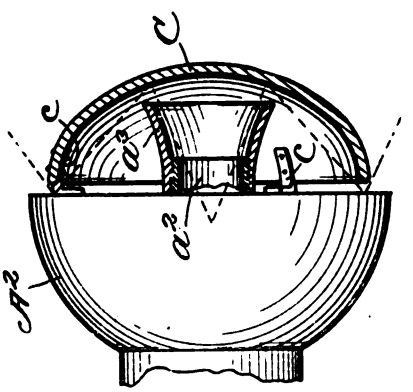
660,613. PROCESS OF AMPLIFYING ELECTRIC CURRENTS.

a conductor *t t* wound upon it and connected to a transmitting telephone circuit. A shaft *g* carries a frame *h*, of vertical conductors surrounding the magnet, and dipping into a mercury trough *i*. A contact is made at the upper end of the shaft *g* by a screw point, and circuit *i i* is led off from the upper and lower terminals thus constituted, to the receiving instrument. The frame *h* is constantly driven by means of belt *g''* on wheel *g'*. Each conductor *h* is revolved around the magnet pole N, parallel to the latter, and being always at the same radial distance from the axis and always at right angles to the lines of force which it cuts. The E. M. F. in circuit *i i* is maintained constant while the magnetism, or rather the sign and density of the magnetic field are constant; but changes in the latter produced by telephone currents in coil *t t* produce corresponding changes in the circuit *i i*, amplified by reason of the energy taken up at *g''*.

The claims are all process claims.

No. 660,796.—G. HOGLUND AND C. M. HEDMAN. HYGIENIC RESONATOR FOR TELEPHONES, ETC.

A resonator C, preferably of hard rubber, is supported on legs *c c*, with a flaring shell A^2, the mouthpiece of the transmitter, $a^2 a^3$, being enclosed. Sound waves follow the path shown in dotted lines, being twice deflected to reach the transmitter. The object is to increase



660,796. HYGIENIC RESONATOR.

the efficiency of the instrument and to lessen liability of lodgment of germs, etc.

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No. 660,572.—R. GÜNTHER. TELEPHONIC APPARATUS.

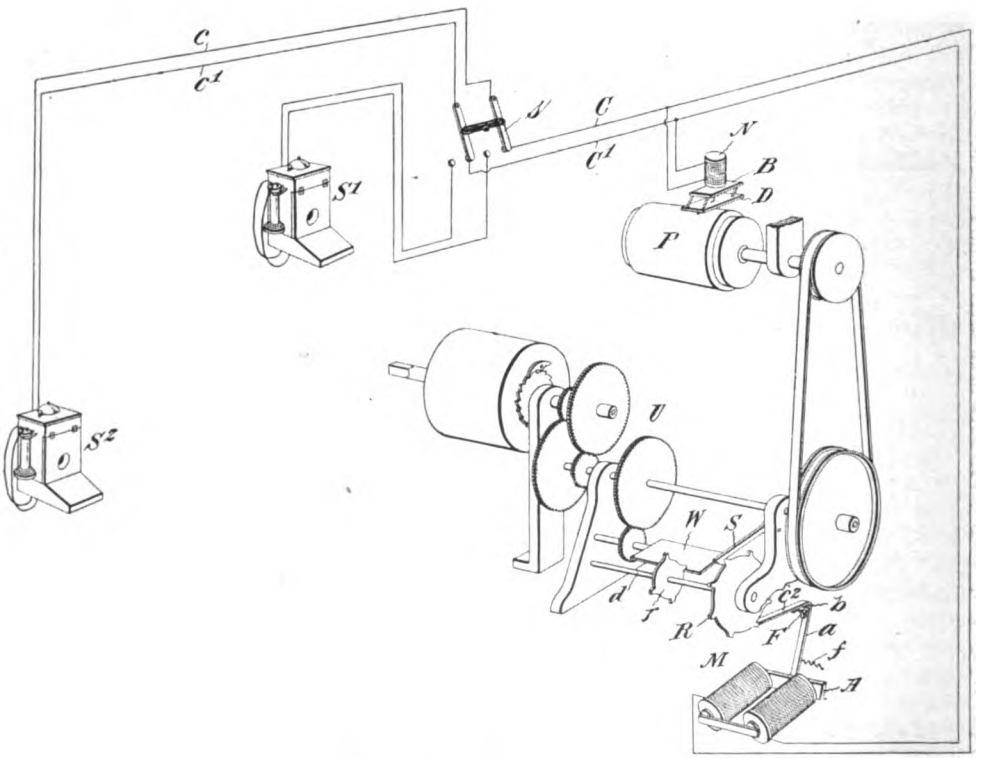
This invention involves the use of a phonograph to record messages received at a telephone station when the subscriber is absent. The method of procedure is simple. At station S′ the telephone apparatus is switched out when the subscriber is absent, and parallel wires C C′ connected to line *c c′* by means of switch *s*. Magnets N and M are connected in parallel from wires C C′. The former acts on the recording stylus of the record cylinder P, and the latter starts the motor U, when a call is made. Magnet M acts thru pawl c^2 on a wheel R, which is mounted on the same shaft as detent wheel *r*, there being twice as many teeth on wheel R as on wheel *r*. One impulse, therefore, turns wheel R a single tooth and wheel *r* a space one half the distance between teeth. This releases the fly W and the motor starts. When the "ring-off" call comes in, magnet M is again energized and turns wheel *r* another half space, bringing a tooth into contact with fly W to stop the motor. When the subscriber returns, he may start the phonograph in the usual way and receive the message left.

No. 660,819.—C. H. NORTH. MAGNETIC SIGNAL.

This is an annunciator for telephone switchboards, having a containing case of iron, bent up to shape, forming the front, rear, sides and bottom of a box. A magnet within this case is adjustable

660,819. MAGNETIC SIGNAL.

from the rear by means of a screw D, and has its forward pole piece curved out to form a sharp projection. A pendulum armature extends across this pole piece and swings with its ends in an opening cut away in the sides of the containing case, being pivoted by a cross-pin, and carrying a long lever arm and target, both of aluminum. The



660,572. TELEPHONIC APPARATUS.

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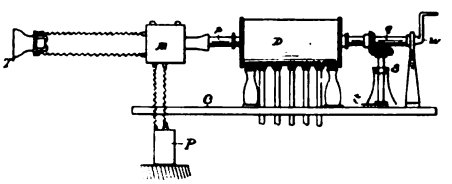
target is normally up in front of the number, but when the magnet is energized the target is drawn down, and the armature up, the latter being prevented from sticking by a strip of brass set in it.

No. 660,802.—M. RUSSO D'ASAR. TELEPHONIC APPARATUS FOR USE ON VESSELS, ETC.

This is a direction indicator for ships at sea. A box with openings at different angles is fastened to the ship's side beneath the water, and the different openings, which have cup or parabolic mouths, are respectively connected to the tubes shown in the figure. The operator, desiring to ascertain accurately the direction of a passing vessel,

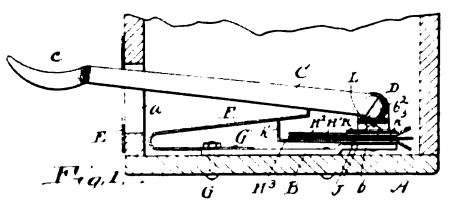


660,802. TELEPHONIC APPARATUS FOR USE ON VESSELS, ETC.

uses the telephone receiver T, which is affected by the transmitter M, the latter in turn responding to sounds transmitted thru the tubes to the drum D. Normally the drum is internally connected with all the tubes by a common port, but when turned on its axis, each tube is successively brought into connection, and when the sound is loudest and clearest the direction may be read off on a graduated circle attached to the base, an arm *i* turning over the circle as the drum is turned.

No. 660,818.—C. H. NORTH. ELECTRIC SWITCH.

This is a switchhook of the "long-lever" type, with a bank of spring con-



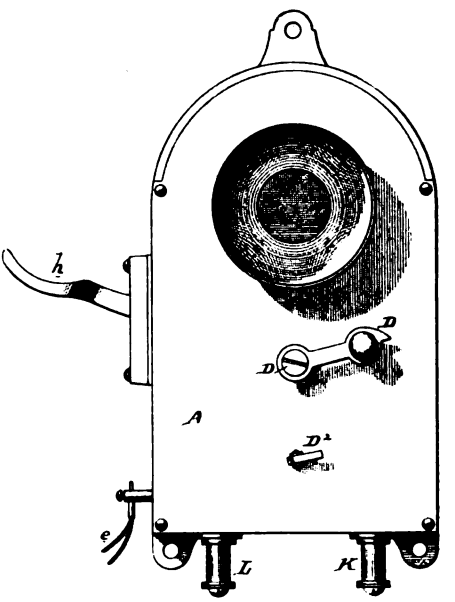
660,818. ELECTRIC SWITCH.

tacts on the base, insulated from each other and moved by the lever thru the agency of the bent end of the motive spring E. The contact springs are shown at H^1, H^2, H^3, the latter being heavy enough to force up the other springs and ensure good contacts when the hook rises. The insulating plates between the springs have central apertures to fit the screw L, but the springs themselves have larger holes so that they do not touch the screw, the necessity for a bushing being thus obviated. The springs are locked by teats struck up on them, which lie in small holes in the insulating plates.

November 6.

No. 661,173.—G. G. GLENN AND W. L. SULLIVAN. ELECTRIC CALL OR SIGNAL BOX.

This is a combined messenger call and telephone box. There is nothing novel in the call or the telephone, by themselves, but the arrangement is such



661,173. ELECTRIC CALL OR SIGNAL BOX.

that when the signal handle is pulled the telephone is short-circuited, and when the telephone is in use its circuit is around the signal wheel.

No. 660,826.—H. D. STROUD. TELEPHONE CALL RECORDER.

This invention contemplates the provision of a register whereby each call of a subscriber is automatically regis-

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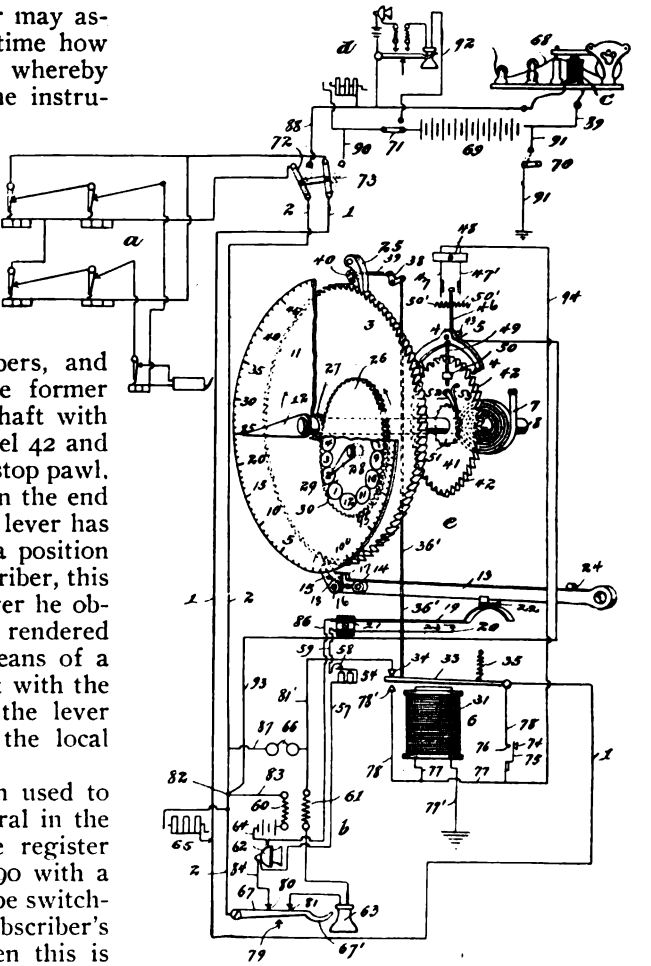
tered; whereby the subscriber may ascertain by inspection at any time how many calls have been made; whereby the calls registered at any one instrument may be automatically recorded at the central office, and at the same time the register or tally device may be reset.

At each subscriber's station, according to the invention, a register is provided consisting of an indicator dial carrying two series of numbers, and geared hands 12 and 28, the former being mounted on the same shaft with a toothed wheel 3, escape wheel 42 and a retracting spring 7; 25 is a stop pawl, and 15 is an actuating pawl on the end of the pivoted lever 13. This lever has its outer end extending into a position to be manipulated by the subscriber, this being required of him whenever he obtains a connection, and being rendered audible to the operator by means of a buzzer 54, connected in circuit with the contacts 19-20, closed when the lever 13 is pushed down, and to the local circuit of the transmitter.

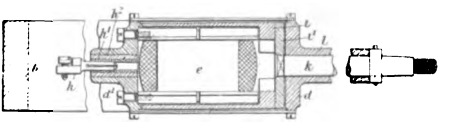
When the register has been used to the limit, it is read from central in the following manner: A Morse register C is included in a circuit 88-90 with a battery 69, and is arranged to be switched into connection with the subscriber's line 1-2, by switch 73. When this is done a magnet 6 at the subscriber's station is energized to release the register by tripping the stop pawl 25, and as the register runs down under the influence of spring 7 the verge 46 of the escapement 4 vibrates between contacts 47 and 47′ to make and break with a branch 94 of the main circuit, thereby producing a number of dots on the tape 68 at the central office, corresponding to the number of calls recorded before the register runs down.



660,826. TELEPHONE CALL RECORDER.

No. 662,316.—F. R. SIMS AND R. BOSCH. MAGNETO ELECTRIC MACHINE.

This is a magneto electric generator having a stationary armature and stationary field, and a movable pair of envelopes or magnetic bridging pieces, *i i*, revolving between the field pole-pieces and the armature. In the diagram *b* is the fixed field, *c* is the fixed armature, and *i i* are the revolving parts.



662,316. MAGNETO ELECTRIC MACHINE.

No. 661,224.—H. MCDONALD. TELEPHONE ARM.

This is a hollow transmitter arm, pivoted between lugs of the usual saddle 10, and with an elongated slot 13, in the rear end of the arm for the wires

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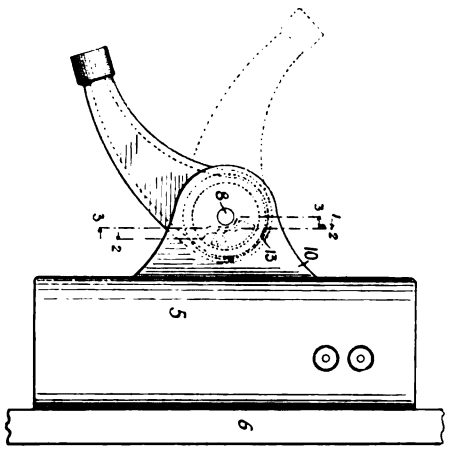
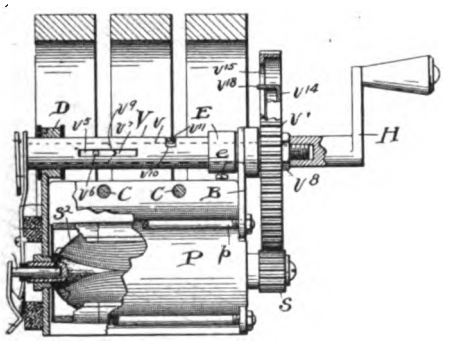
to pass out thru. In the side of the arm is a depression 12, and on the inner face of one lug 10, is a pin 11, lying in the depression and serving as a limiting stop for the movement of the arm.



661,224. TELEPHONE ARM.

No. 660,820.—C. H. NORTH. MAGNETO ELECTRIC GENERATOR.

This is a magneto hand machine of the type usually employed with telephone instruments. The principal part of the invention lies in the shunt, which forms part of the driving shaft. This shaft is essentially a tube V, having a short section of rod in one end, shown

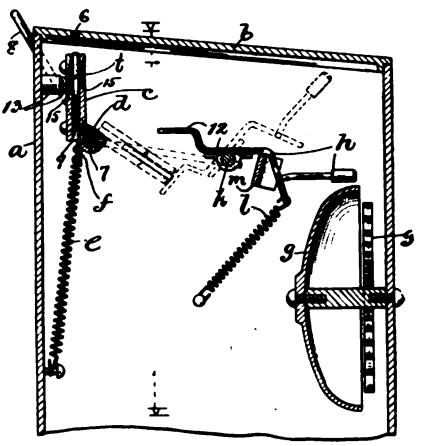


660,820. MAGNETO ELECTRIC GENERATOR.

at v^5, and a longer section of rod extending thru to the handle H, the meeting ends of these two rods being notched in V shape to form cam faces. The short rod has a pin v^6 working in a longitudinal slot, and the long rod has a pin v^{11} working in a circumferential slot in the tube. The result is that when the handle is turned the long rod is turned with it, but being unable to move lengthwise by reason of the pin v^{11}, and the rod v^5 being unable to turn by reason of the pin v^6, the latter rod is forced lengthwise out of the end of the tube. Upon its end is carried an insulating button, which thereupon lifts the spring R away from the end of the tube, upon which it normally rests, thus breaking the shunt. Where it is desired to shunt the home ringer when operating the generator a spring R′ is provided, against which the shunt spring comes when it is forced away from the tube.

No. 661,578.—W. A. FOSS. TOLL COLLECTING DEVICE FOR TELEPHONES.

In this device, a box *a* contains a bell *g*, mounted to be struck by a hammer *h*, carried by an arm 12, pivoted at *k* and pulled down against the stop *m* by a



661,578. TOLL-COLLECTING DEVICE FOR TELEPHONES.

spring *l*. The coin is dropped into a slot 6 and falls into a chute 15, formed of two parallel pieces under each slot, the entire set being pivoted on a lengthwise shaft *d* and normally held vertical by a spring *e*. Each chute has a crosswise cut thru it aligned with the lever 12, and the bar *d* is adapted to be turned by a handle *h* on the outside of the box so as to bring the parts 15 down past the lever 12. If a coin is not in the chute, the parts will idly pass each

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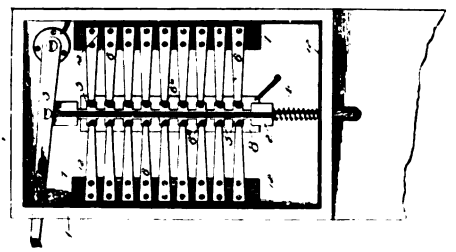
other; but if the proper coin is in the chute, lever 12 will be forced down as shown in dotted lines, to strike the bell.

No. 661,465.—N. BASSETT. ELECTRICAL SWITCH.

This is an intercommunicating switch, by the use of which the inventor claims that it is impossible to leave the telephone without restoring the switch automatically to its zero position.

The device is mounted in a box 12, in the upper part of which the switch hook 3 is pivoted, having a sliding bar 2 connected for vertical motion to the hook. This bar has a number of teeth 5, underlying an equal number of

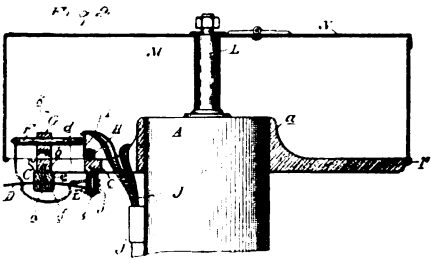


661,465. ELECTRICAL SWITCH.

springs 6, each of which is connected to an individual wire leading to some one of the stations in the system. When it is desired to call one station, a pin is inserted in the front of the box which presses the corresponding spring 6 back past the tooth (over which it springs), an intercontact with the strip 8, connected to battery. When pressure on the pin is relaxed the spring comes back against the inside of the rod 2, which is connected to the home telephone. When the telephone is hung up on the hook at the end of the conversation, the teeth 5 are brought down out of the paths of the springs and the latter are all restored automatically to their original positions.

No. 662,244.—P. G. REYNOLDS. POLE TOP.

This is a pole-top distributing box or terminal box. It consists essentially of a polygonal frame *a*, having spider arms to support it on the ring around the pole-head, insulating clamps and anchor studs being arranged on the parallel strips of the frame, and rows of fuses being also carried thereon by insulating supports. In the figure C is the

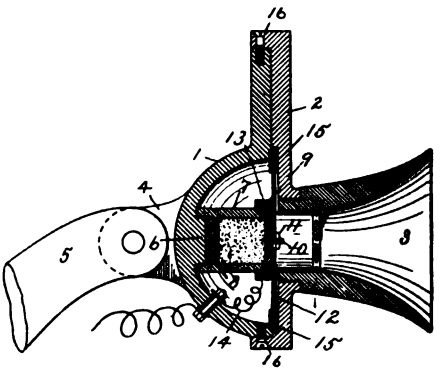


662,244. POLE TOP.

insulating clamp, E the anchor to which the wire is taken from the clamp, F the fuse to which it next comes, G the insulating support of the latter, I a row of contact springs for the fuses, and J the cable. M is a sheet metal cover for the whole.

No. 661,260.—R. H. FERGUSON. TRANSMITTER.

This is a granular telephone transmitter having its shell or casing made in two halves 1 and 2, the former having a projecting lug 6 upon which is secured a carbon block 8 surrounded by a rubber tube 7 containing the granular



661,260. TRANSMITTER.

material, the front end of the tube being closed by a conducting cap 13, sufficiently flexible to vibrate in response to sound waves, and clamped to the diaphragm 12 by the nut and screw 10-11. The front half of the shell binds the diaphragm in place and is secured by the screw 16.

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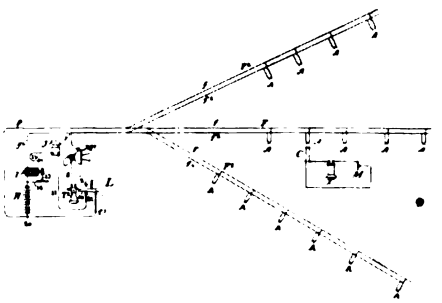
No. 661,714.— I. H. FARNHAM AND G. W. DAVIS. TELEPHONE CIRCUIT.

This is a bridging pole-box system, intended for use by conductors on trains or electric cars, wires being carried along the poles or other wire supports, and at intervals provided with open jacks connected in parallel. Each car or train has a box containing a trans-



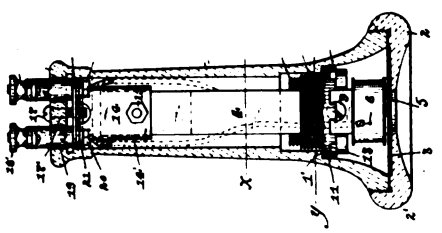
661,714. TELEPHONE CIRCUIT.

mitter and receiver. These are shown diagrammatically at M T in the figure. At the central station or office is a telephone set M^2 T^2 L, with hook-switch normally down to complete the circuit of a bell J. Battery H is to line thru relay I.

When a box is plugged in on one of the jacks along the line, the instruments M T are at once bridged, current flows from battery H to line, the relay I is energized, and the bell circuit is closed. When receiver T^2 is taken down to answer, the bell is cut out and the battery remains bridged between the office instrument and line to furnish current for talking.

No. 661,998.— H. H. HIPWELL. TELEPHONE RECEIVER.

This is a receiver having a removable magnet structure, the shell being made with apertures in its small end for the withdrawal of the binding-posts so that by taking off the cap and dia-

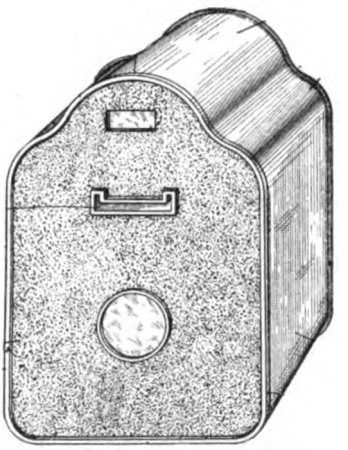


661,998. TELEPHONE RECEIVER.

phragm the magnet and all its appendages may be removed from the large end of the shell. The principal point in the invention is the adjusting means. This consists of a threaded ring 11 screwing on the block 10 which carries the magnets, the shoulder 1′ in the shell forming a bearing face for the ring 11. By loosening the screws 17 in the heel piece, the inventor says, a nail or other convenient implement may be used to turn the ring 11, notches 13 being provided for the purpose.

No. 33,593.— DESIGN. W. A. FOSS. CASE FOR SLOT TELEPHONES.

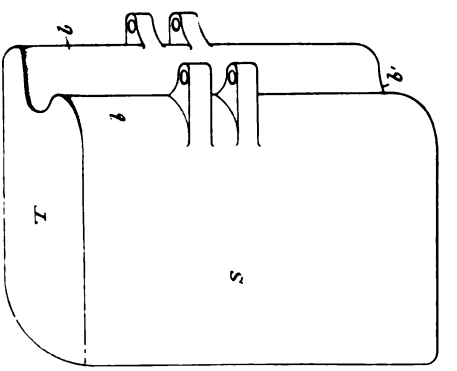
A design for the box or case for pay station boxes, having the shape shown.



33,593. CASE FOR SLOT TELEPHONES.

No. 33,594.— DESIGN. W. D. GHARKY. TELEPHONE POLE BOX.

A design for a telephone pole-box, having the shape shown, with a vertical depression in the back.



33,594. TELEPHONE POLE BOX.

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BATTERIES FOR TELEPHONE EXCHANGE SERVICE.

One of the important items of expense which deserves due consideration in the successful operation of a telephone exchange is battery power.

Many experiments and comparative tests have been made from time to time by the large consumers of battery power to determine the relative value of the dry battery as compared to the liquid sal ammoniac battery, which was almost universally used in the early days of telephone service. Wherever these comparative tests have been conducted on a

thoro and prolonged basis the results were universally in favor of the specially constructed dry cells.

The dry cell illustrated herewith and known as the 1900, is now almost universally adopted, not only by the leading telephone manufacturers, but also by many of the largest Bell and Independent companies in this country, and in many of the foreign exchanges.

The manufacturers of this battery have studied the requirements of the telephone trade and have endeavored to manufacture the best battery that can be produced for this purpose. How well they have succeeded is best shown by the rapidly increasing demand for this battery. During the past, over one million cells of 1900 batteries have been manufactured and shipped to the trade.

The company's guarantee to the telephone trade is as follows: The 1900 dry battery, when used in connection with transmitters having from 30 to 35 ohms' resistance in ordinary exchange service, will give not less than eighteen months' continuous service without attention of any kind. When used in connection with modern constructed transmitters having from 60 to 75 ohms' resistance in the battery circuit, the 1900 battery will give not less than two years' continuous exchange service.

THE FARMERS' MUTUAL IN OHIO.

The different sections now have 126 miles of line and branches are being built thru different sections by new societies. Each section is independent of the others, altho they are really one large section on the mutual plan. The lines now have a central office at Resaca and reach out from that switchboard to Chuckery, Irwin, Milford Center, Rosedale, Mechanicsburg, Marion, Sanford's residence, Plumwood, Lafayette, Gillivan, Beacher, West Jefferson and Alton. Farmers all along the lines have 'phones and are getting great benefits from them, and town residents who have heretofore looked with suspicion on the Farmers' Telephone are now beginning to see the great benefits to be derived from it and are pushing the matter along.

Each section has a president, secretary, treasurer and three directors, who look after the interests of their respective section. Any member joining the company purchases a book that costs from $13.75 to $16, depending on location, and pays his pro rata on the cost of the line, usually only about $12, because of the revenues from non-members for toll messages, which are applied to extensions.

Wisconsin has a similar plan, which

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embodies the issuing of bonds by the townships, for construction. Illinois has tried varied propositions. At Athens thirty-two farmers formed a company and constructed a line about sixteen and one-half miles long at a cost of $45 a mile for a two-wire metallic circuit. The poles were white oak, peeled, six inches in diameter at the top, and twenty-three feet long, costing, delivered along the line, 51 cents each. Long-distance instruments are used, for which an annual rental of $5 each is paid. The subscribers have free service among themselves and pay the regular service fees when a toll line is used.

NEW AMERICAN TELEPHONE.

The American Electric Telephone Company has recently placed upon the market a new equipment that can be used in connection with the local exchange. In Fig. 1 we show the interior of this 'phone. The receiver, switch hook, transmitter and induction coil are of the highest possible grade and efficiency. The generator used in this equipment may be of the regular local exchange type or special high-efficiency toll-line work, either for bridging or series system; the magneto ringer being of the long or short coil type, depending upon whether the equipment is to be used in connection with series or bridging lines. The lightning arrester is similar to that shown in Fig. 1. In Fig. 2 is shown the general view of the instrument.

The operative elements of this equipment are accessible by swinging the entire front to the right and thus exposing all of the parts mounted in the box.

The American Company announces that it is now in position to supply in-

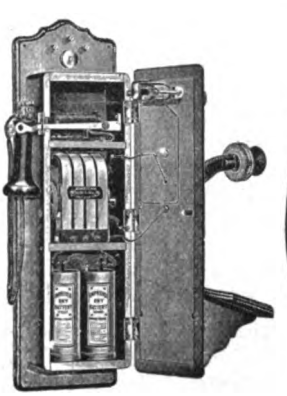


FIG. 1.

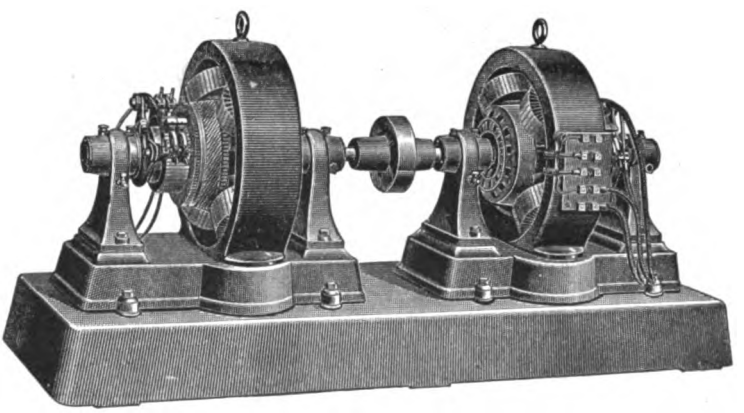
FIG. 2.

struments of the above construction in any desired quantities, and wire the equipment for any desired service, whether it be for local exchange, series or bridge toll, central energy or centralized call system.

THE HOLTZER-CABOT CHARGING GENERATOR.

The Holtzer-Cabot Charging Generator and Dynamo for direct service has now become a familiar piece of apparatus in many of the leading telephone exchanges. The illustration herewith shows their latest production specially designed for telephone work.

It consists of standard D. C. multipolar slow-speed motor mounted on a substantial iron base and connected to



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the special telephone generator by means of a flexible, insulated coupling.

Patents have been allowed on the most important features of this telephone dynamo, and the peculiar form of armature winding, shape of the pole shoes and the large number of segments and coils make this machine an ideal one for a modern telephone exchange, operating on a common battery or central energy system.

They are used for charging storage batteries in multiple with the service mains and also for direct service. The latter case is a most severe test of the machine as a noiseless dynamo, but in all cases where a properly proportioned retardation or choking coil has been used, the result has been eminently satisfactory to the ordinary subscriber, or even that limited but prominent class known as "chronic kickers," the character of the current is such that they can not tell whether it is being supplied from a battery or a dynamo.

The company has many orders in hand for this particular machine, ranging in sizes from 1 kw. to 10 kw. output. A special bulletin is now in course of preparation, covering the peculiar features of the apparatus, and giving the curves and other data, substantiating the unusual claims made for the apparatus by the manufacturers.

NEW EUREKA APPARATUS.

Among the many new devices which have been put upon the market by the Independent manufacturers, the Eureka Combination Switchboard is one of the appliances that is said to be one of the most desired switchboards for an exchange to adopt. It is shown in Fig. 1 complete. The right-hand section of this board is intended for the local exchange and the left-hand section is for the toll lines. Nearly all the leading manufacturers have built combination boards, but this one is claimed by the manufacturers to be the most complete combination switchboard ever built. The ringers of this board are in multiple with the drops. The company has built a number of these boards in various styles and capacities. This company will be pleased to furnish complete information in regard to this board. As shown in Fig. 2, this company manufactures what it claims to be the most complete line of high-grade toll-line and branch auxiliary switchboard apparatus. Fig. 2 shows a 10-line board. In their ad. in this month's issue a cut of a 25-capacity board is shown.

The company also desires to call attention to its pay-station slot tele-

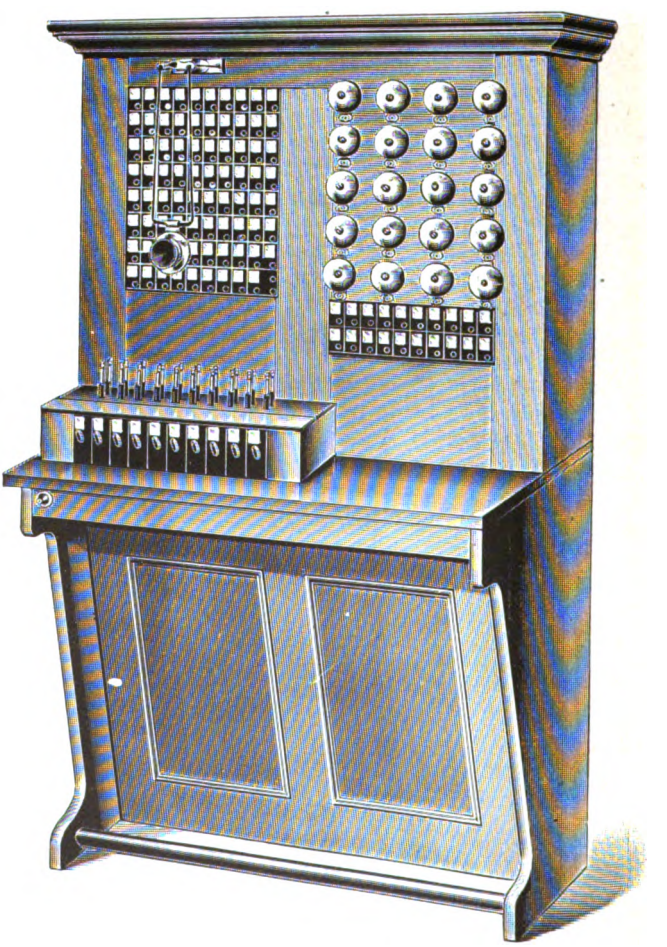

FIG. 1.

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phones, which are furnished either for single coin or for a combination of any two, three or four different coins, as may be desired by the company desiring to install high-grade pay-station apparatus. Any special data or information on these instruments for this class of work the company will be pleased to

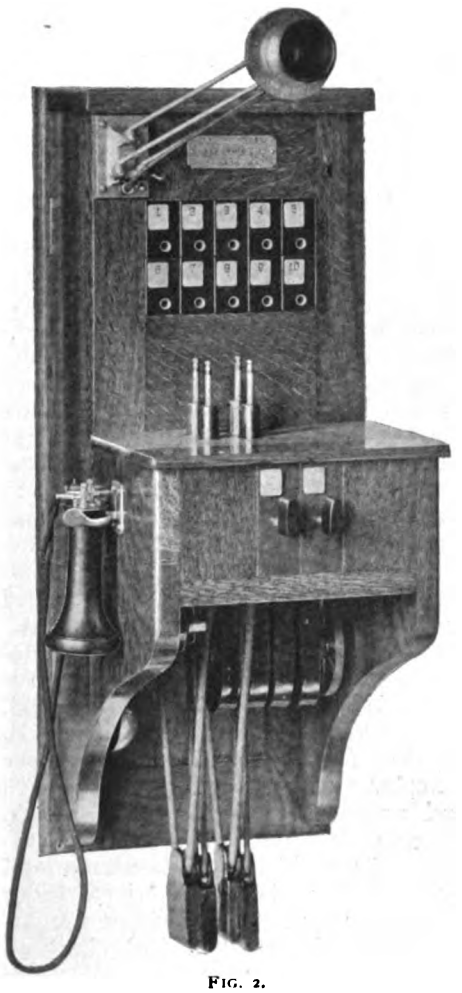

FIG. 2.

furnish. The cross-connecting board, shown in Fig. 3 as style "D" is a very improved piece of apparatus. This cross-connecting board is furnished either with or without carbon lightning arresters. The cabinets are very beautiful and are made to match the Eureka switchboard cabinet, and are said to make a very handsome outfit.

The company will be pleased to furnish its "Twentieth Century" cata-

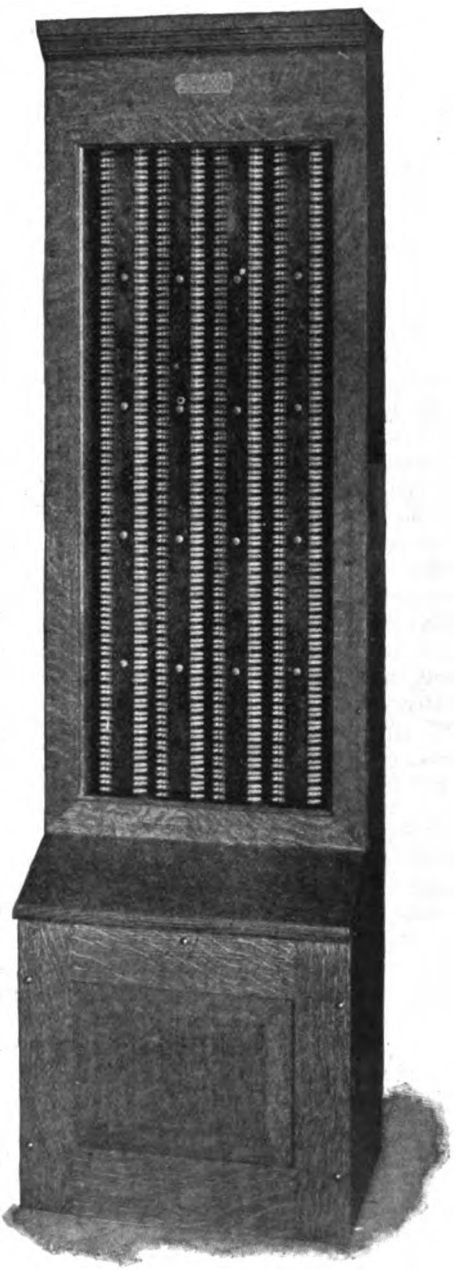

FIG. 3.

log, which describes and illustrates the complete line of Eureka apparatus, on application.

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TRADE NOTES.

THE Western Electric Supply Company, St. Louis, Missouri, announces to its many friends and patrons that it will be pleased to send out its set of printed matter upon request, and joins in wishing them a year filled with prosperous business with few obstacles.

THE EUREKA ELECTRIC COMPANY, 157-167 South Canal street, Chicago, desires to inform its friends and patrons that on February 1, 1901, it will remove to the new Eureka Electric building, located at 143 and 145 South Clinton street. The company desires to inform its customers that it will be better equipped than ever before, and in every way will be better able to take care of the trade to an advantage in the interests of its customers. The building will be devoted exclusively — the entire six floors covering 50,000 square feet — to the manufacture of the high-grade Eureka apparatus, embracing the well-known Eureka Metallic Express switchboard, telephones, protectors, lightning arresters and exchange appliances. The company desires to thank its friends and patrons for past favors and bespeaks at this time a continuance at the new quarters, which it hopes to occupy by not later than February 1.

SUN ELECTRIC MANUFACTURING COMPANY.—This new and enterprising Eastern manufacturing concern, some of whose apparatus is illustrated elsewhere in this issue, reports a large and increasing sale of its product. Messrs. Clement & Gharky, of the company, are well-known telephone engineers, and are giving their undivided attention to increasing their already extensive variety of goods. The company has a large, newly equipped plant, with all modern machinery and a picked set of workmen. Many forms of apparatus heretofore considered special are arranged to be produced as standard in this factory, and prompt shipments are promised in all cases. Mr. Charles P. Platt, who is the general sales agent of the Sun Company, will be remembered as having been prominently identified with several of the large Western companies for a number of years. Since he has become connected with the Sun Company the domestic trade has been supplemented by a number of large orders for export. A considerable amount of apparatus has been shipped to England, Belgium, Africa and the Orient. This business bids fair in time to rival the export business in other lines of electrical apparatus and to increase as rapidly. The general offices of the Sun Company are in the Stephen Girard building, in Philadelphia, and its factories at Memphis and Tioga streets in the same city.

THE WESTERN TELEPHONE CONSTRUCTION COMPANY, CHICAGO, ILL.—During the past eight months this company has, under its new organization and management, done a most successful business. In this short time it has secured more contracts for large exchange multiple equipments than those received by all other manufacturers combined. The cities to be equipped by the "Western" are Pottsville and Williamsport, Pa.; Corsicana, Tex.; Greensboro, N. C., and Binghamton, N. Y. In addition to the contracts named it has also recently shipped a 200-line "Western Express" switchboard to J. P. Helfenstein, Ashland, Pa., and has booked orders for 100-line "Western Express" switchboards for the Columbia Telephone Company, Columbia, Pa.; Mutual Telephone Company, Greenfield, Ohio (for Leesburg, Ohio); J. B. Rhodes, Zanesville, Ohio; Lancaster Telephone Company, Lancaster, Ky., and smaller orders for other points. Large orders for telephones have recently been filled for Leesburg and Eaton, Ohio; also an additional order for telephones from the Chicago & Alton Railroad, for their lines between Chicago and Bloomington. Orders for the new Western Express No. 3 bridging telephones are very satisfactory. The strength and size of generators and good ringing qualities of these instruments have caused their adoption by many farmers' lines and long-distance companies. To its many customers and friends the "Western" sends its greetings, wishing all a prosperous New Year.

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TELEPHONE NEWS.

SODUS, N. Y.—A local telephone exchange was organized at Sodus.

HAMILTON, OHIO.—A franchise was granted to the City & Suburban Telephone Company.

COLUMBUS, OHIO.—The Harrison County Telephone Company has a capital stock of $25,000.

CANTON, OHIO.—The Canton city council granted a franchise to the Stark County Telephone Company.

BRYAN, TEX.—The Bryan Telephone Company has been incorporated, with a capital stock of $12,000.

CHAGRIN FALLS, OHIO.—The Chagrin Falls Telephone Company was incorporated with a capital stock of $15,000.

MECHANICSBURG, OHIO.—The Farmers' Mutual Telephone Association Company has a capital stock of $10,000.

BARBERTON, OHIO.—The capital stock of the People's Telephone Company has been increased from $200,000 to $500,000.

LA RUE, OHIO.—The La Rue Telephone Company was granted a franchise for Mount Victory by the council of that village.

GRAND RAPIDS, WIS.—The Coöperative Telephone Company, of Grand Rapids, Wisconsin, has increased its capital stock to $10,000.

BATAVIA, N. Y.—The aldermen of Batavia have granted a franchise to the Rawson Electric Company to install a telephone system in this city.

SALINA, KAN.—The Salina Telephone Company has completed toll connection with towns on the Missouri Pacific as far west as Hoisington.

LA GRANGE, MO.—The Lewis County Telephone Company expects to equip all of its long-distance lines with the metallic circuit within the next few months

ST. CLAIR COUNTY, MO.—Samuel C. Smiley has been granted a twenty-year franchise by the town board of O'Fallon to construct and operate a telephone system in that town.

ERIE, PA.—The shareholders of the Wisconsin Telephone Company, a branch of the Erie Telephone Company, increased the capital stock of the company from $3,000,000 to $5,000,000.

MILTON, WIS.—Clem. W. Crumb, B. H. Wells, J. H. Owen and J. A. Paul are the incorporators of a company organized to build a telephone exchange for the village of Milton Junction.

SPENCER, IND.—S. N. Quillin, John Smith, Hugh Devore, Sam Alverson and George Lawson, acting as a committee for the People's Free Telephone Company, have made arrangements to open an exchange in this town.

PORTLAND, IND.—The Pennville Telephone Company has been organized with a capital stock of $2,000, and the following officers: President, Dr. F. E. Moyer; treasurer, Dr. W. M. Hall; secretary, M. B. McCarty, and manager, Jay Lineback.

DEER ISLE, ME.—The New England Telephone & Telegraph Company has purchased the franchise and line of the Deer Isle Telephone Company. The New England Company will lay a cable across Eggemoggin beach, two miles, to connect Deer Isle, Me., with the system.

MOUNT VERNON, KY.—The Bastin Telephone Company, recently incorporated with a capital stock of $25,000, has purchased the Crab Orchard, Stanford and Mount Vernon lines, the Lancaster exchange and Garrard County lines, including three exchanges and two hundred miles of toll lines.

MANTON, MICH.—The Swaverly Telephone Company has sold its Manton exchange and the line from Cadillac to Manton and Sherman, to the Citizens' Company, of Grand Rapids, but they still retain the line from Manton north to Traverse City and Petoskey and east through Missaukee County.

ALBANY, N. Y.—Among the incorporations filed here was that of the Independent Union Telephone Company, of Buffalo, to maintain telephone lines between Buffalo, Rochester, Syracuse, Utica, Albany, Troy and the vicinity cities, towns and villages in central and western New York. The capital is $200,000.

NORWALK, OHIO.—The Norwalk & Huron County Telephone Company, composed of local and outside citizens, which has been incorporated with a capital stock of $80,000, has assumed control of the Norwalk Telephone Company's plant, which it will improve and enlarge and to which it will add other lines in this vicinity.

DENISON, TEX.—The United States Telephone Company made application to the city council for a franchise to put in a telephone exchange here. The franchise was granted and the exchange will be inaugurated as soon as material can be brought here. It is the intention also to connect Denison and Sherman by long-distance telephone.

ELKHART COUNTY, IND.—The Home Telephone Company, of Elkhart County, has decided to construct a full metallic line from Goshen to Milford, there to connect with the Warsaw Independent Telephone Company's line, recently purchased by Straus Bros. & Co., of this city, who will shortly construct a direct Independent line to Indianapolis.

ARCADIA, IND.—The board of commissioners has granted the Central Indiana Telephone Company a twenty years' franchise to put an exchange in the town of Arcadia and also for the use of the public highways in Jackson and White River townships for the extension of the lines. The franchise will be

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void if work on the lines is not commenced within a year.

SIKESTON, MO.—The Sikeston Telephone Company has a capital stock of $12,000.

PRATT CITY, ALA.—The People's Home Telephone exchange is now in operation.

ASHEVILLE, N. C.—Mr. Alexander Field is building a number of telephone exchanges.

WAYNESBORO, GA.—The Waynesboro Telephone Company was incorporated, with a capital stock of $10,000.

SHAMOKIN, PA.—The Shamokin Telephone Company offers for sale $6,000 of its first mortgage 5-30 bonds.

CENTERVILLE, MO.—The Reynolds County Telephone Company was incorporated with a capital stock of $1,000.

DUNDEE, N. Y.—A telephone exchange has been established between Dundee and Starkey and Eddytown.

OAKFORD, ILL.—At a special meeting of the town council a franchise was granted to the Central Union Telephone Company.

STEAMBOAT SPRINGS, COLO.—The Colorado Telephone Company is engaged in extending its line from Glenwood Springs to Grand Junction.

SHERMAN, TEX.—The city council granted a franchise to Frank B. McElroy and associates to operate a system of telephones in Sherman.

MONMOUTH, ILL.—An Independent telephone company has been organized at Monmouth and three hundred subscribers have been secured.

MOUNT PULASKI, ILL.—The incorporation of the Mount Pulaski Telephone & Electric Company has been licensed. The company has a capital stock of $5,000.

CORBIN, KY.—The Whitley Telephone Company is preparing to build lines to Corbin and London. A line will also be built to Jellico, and probably other points in Tennessee.

STEAMBOAT SPRINGS, COLO.—The town council recently granted a twenty-year franchise to G. H. Smedley, and the plant is expected to be in operation within three months.

PLAINVILLE, KAN.—An ordinance granting to Michael Cronin, of Plainville, Kan., his heirs and assigns, a franchise to construct, operate and maintain a telephone system in the city of Plainville, Kansas.

CISCO, ILL.—C. E. Schance, of Cherry Point, has been granted a franchise for a telephone plant at Cisco, located about twenty miles north of Decatur on the Champaign branch of the Illinois Central.

GAFFNEY, S. C.—The Gaffney Telephone Company, of Gaffney, has been commissioned. The capital stock is $10,000. The purpose is to establish a telephone exchange in Gaffney, extending to adjoining towns.

NORTH FOND DU LAC, WIS.—At a meeting of the board of directors of the Fond du Lac Land Company a franchise was granted the Little Wolf Telephone Company to put in an exchange at North Fond du Lac.

FAYETTEVILLE, ARK.—The North Arkansas Telephone Company has purchased the business of the Fayetteville Telephone Company, which includes the exchange at Fayetteville, a toll line from Fayetteville to Huntsville, one to West Fork and one to Wheeler and Hoover by the way of Elm Springs.

MOUNT PULASKI, ILL.—The incorporation of the Mount Pulaski Telephone and Electric Company was licensed. The company is capitalized at $5,000 and will maintain its principal office at Mount Pulaski.

INDIANAPOLIS, IND.—Northern Indiana & Southern Michigan Telegraph Company, Lagrange. Establish telephone and telegraph lines. Capital stock $20,000. Incorporators: A. J. Hostetter, R. Ellison, A. H. Ellison, all of Lagrange.

PENNVILLE, IND.—The Pennville Telephone Company was organized December 3, and will at once put in an exchange. Stock amounting to $2,000 has been subscribed for by local men, and twenty-seven 'phones have already been engaged.

PEKIN, ILL.—S. S. Tanner, R. C. Crihfield, of Minier, and E. L. Schmutz, of Tremont, were granted the privilege of stringing a telephone wire and maintaining a telephone system along the highways of Little Mackinaw and Tremont townships.

BUFFALO, N. Y.—Independent Union Telephone Company, of Buffalo, to maintain telephone lines between Buffalo, Rochester, Syracuse, Utica, Albany, Troy and other cities, towns and villages in central and western New York; capital stock, $200,000.

GRAND RAPIDS, WIS.—The Telephone Toll Line Company has completed the line between here and Marshfield. This line will prove a great convenience for communication between here and Marshfield, as all mails have to go a roundabout way and telegrams have had to go via La Crosse and Milwaukee before reaching Marshfield, a distance as the crow flies of twenty-six miles. Service is free till January 1.

COHOES, N. Y.—A petition was received from John Clute and Hugh Graham asking that an extension of time be granted to the telephone and telegraph company which they represent and to which a franchise was granted by the common council last January if the system was constructed and in running order by January 1, 1901. The time was asked for as the system is not completed yet. An extension of eighteen months was granted.

HAMPDEN, MASS.—The Westfield selectmen have granted a conditional franchise to the Hampden Automatic Telephone Company to place its wires and telephones in that town. Many local capitalists are interested in this company, and it will be remembered that a franchise was granted in Springfield some time ago. At a meeting of the Westfield selectmen recently a form of franchise containing a full page of conditions and restrictions was drawn up and adopted. The principal conditions are three in number: That the officers of the various town departments to be supplied with telephones; that Westfield people be given free communication with Springfield, and that all wires of

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the company located in Westfield be laid underground.

LUTHERVILLE, MD.— Montgomery B. Corkran has sold for $15,000 all his interest in the exchange at Lutherville.

BATAVIA, N. Y.—A franchise was granted the Rawson Electric Company to install a telephone system in Batavia.

SALINA, KAN.— Long-distance telephone lines are completed from Salina to Plainville and Stockton via Delphos.

SEATTLE, WASH.—A feature of the council meeting was the application for a telephone franchise by George C. Hunt, a resident of Seattle.

SARATOGA, WYO.—The Rocky Mountain Bell Telephone Company will construct branch lines from Laramie to a number of rural districts in the valleys of the Big and Little Laramie rivers.

WILBURTON, I. T.—The Cherokee legislature has granted franchises to build telephone lines; one from Owasso to Caney, Kansas; one from Stillwell to Tahlequah, and a line from Vinita to Red Fork.

HILLSBORO, ILL.—The Montgomery County Telephone Company held its annual meeting and elected C. W. Bliss, president; Garrilt Carstens, vice-president; A. M. Howell, secretary, and J. J. Frey, treasurer.

CHICAGO, ILL.— It is rumored that the Western Union Telegraph Company intends embarking in the telephone business on a large scale, making the enterprise equal in magnitude to the telegraph system.

EWING, NEB.— Ewing will soon have telephone connections with the outside world. The poles for an Independent line between here and Deloit, Iowa, are up and the work of stringing the wires has commenced.

CHAMPAIGN, ILL.—A telephone war is on in Champaign and Urbana. The Central Union Company has cut the price to 50 cents a month for houses and $1 for business houses. The Home Company, a rival concern, is expected to follow suit.

OAKLAND, NEB.—The Nebraska Telephone Company has closed a contract to build a line to Bertha, ten miles northeast from Oakland, to connect here, and superseding the farmers' line in contemplation to the same place. It starts off with about a dozen subscribers.

BERLIN, PA.—A charter was granted at Harrisburg to the Huntingdon and Clearfield Telephone Company, Huntingdon; capital stock, $1,000. The company will build a telephone line thru the counties of Bedford, Fulton, Huntingdon, Blair, Center, Clearfield and Cambria.

BALTIMORE, MD.—Annie C. Depro, by Attorneys Charles and Arthur Herzog, brought suit in the city court against the Maryland Telephone & Telegraph Company, claiming $5,000 damages for alleged illegal trespass on plaintiff's property, on Wolfe street, and affixing wires thereto.

DOVER, DEL.—The Diamond State Telephone Company, which has lines all over the Maryland and Delaware peninsula, will shortly commence work at erecting poles and extending its line to the lower part of Cecil and Kent counties, taking in all the towns of any importance along the route.

AUSTIN, TEX.—At a special meeting of the city council held December 4, J. B. Earl and J. E. Boynton, of Waco, were granted a franchise to establish an Independent telephone system in Austin. The new company will begin work as soon as their plans can be arranged, and bind themselves to have the system in operation within fifteen months. They expect to expend fully $100,000 in the work.

DES MOINES, IOWA.—Three million dollars has been added to the capital stock of the Iowa Telephone Company. This addition was made at a meeting of the directory board in Davenport. The capital stock formerly was $1,000,000. The money will be used in improvements, one of the features to be an underground system of wires. The company will make arrangements at once to alter its wires at this point, tho it is expected little will be done until spring. The increase was largely necessitated by the local situation, where underground wires have been ordered.

JACKSON, MICH.— Manager J. W. Martin, of the Oakland Telephone Company, states that success of the Independent movement outside of Oakland County is in sight. He has been granted a franchise in Jackson and in Macomb County. The Mount Clemens council has the matter under advisement and will likely pass the franchise at its next meeting. Mr. Martin states that the Independent movement is gaining ground in Detroit, and that the Detroit council will take definite action in the near future. It is his opinion that the telephone of the future will be that provided by local companies in every county.

GOOD CONSTRUCTION.

One of the largest Independent telephone companies makes it a rule to avoid the use of braces in fine residence or business property. The earth is removed from around the pole, say eight feet square and eight feet deep, under average conditions, and the hole is then filled with concrete, or rubble and cement, and the pole practically sets in solid rock to stay there without repairs.

THE Central Telephone Electric Company, St. Louis, Missouri, is sending out a handsome souvenir watch charm. This is something every telephone man should have. It will be pleased to send one of these souvenirs upon receipt of your request. The company wishes its many patrons and friends a happy and prosperous new year.

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Wanted.

COMMENCING WITH THE DECEMBER ISSUE, we will add to our paper want columns, which will appear on this page under the heading of "WANTS." They will be classified under the following heads:

HELP WANTED,
SITUATIONS WANTED,
STOCK WANTED,
CAPITAL WANTED,
EXCHANGES FOR SALE,
MATERIAL FOR SALE and
MISCELLANEOUS WANTS.

The rate under these headings will be seven cents per word.

POSITION WANTED—Expert Telephonist with six years' active experience in every branch of the business, desires a position as manager or builder of new exchange. Strictly temperate. Best references. Address F. H. PITT, 72 Hough Place, Cleveland, Ohio.

WANTED—Ladies and gentlemen to introduce the "hottest" seller on earth, Dr. White's Electric Comb, patented 1899. Agents are coining money. Cures all forms of scalp ailments, headaches, etc., yet costs the same as an ordinary comb. Send 50 cents in stamps for sample. D. N. ROSE, General Manager, Decatur, Ill.

WANTED—Business men and women to take exclusive agency for a State, and control sub-agents handling Dr. White's Electric Comb; $3,000 per month compensation. Fact. Call, and I'll prove it. D. N. ROSE, General Manager, Decatur, Ill.

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Telephone Magazine

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Entered at the Chicago Postoffice as mail matter of the Second Class.

VOL. XVII. CHICAGO, FEBRUARY, 1901. NO. 113

TELEPHONE LINE TO CROSS OCEAN.

Dr. Michael Idvorsky Pupin, professor of Electrical Engineering at Columbia College, New York, has invented a long-distance system of telephone transmission wherein ordinary cables can be so equipped with "choke" or retardation coils that speech can be carried over lines of almost any length.

His patents cover the art of ocean telephony and in the minds of some

DR. MICHAEL IDVORSKY PUPIN.

of the best American engineers solves the problem of long-distance overhead lines.

Tests covering almost a year have been made in the interests of the American Telephone & Telegraph Company, the Bell parent, which resulted in a sale of his invention to that corporation. The price paid, it seems, was $200,000 cash and in addition a salary of $7,500 per year for the life of the patent. That this company so promptly absorbed the patents shows of itself the value of the invention.

It has been thought necessary in order to talk a given distance, say 500 miles, in underground cables, to employ large copper wires covered with insulating material. The expense of such wires and material has been sufficient to prevent the construction of long underground circuits. Dr. Pupin's invention is declared to furnish a method whereby conductors of relatively small diameter covered with insulating material of moderate thickness may be used in place of the large and expensive conductors formerly thought to be necessary. Dr. Pupin discovered that it was possible to telephone over vastly greater lengths of cable than had ever been possible before and is able to make any desired length of telephone circuit easily possible. He has shown a design for retardation coils to be introduced at appropriate intervals in a cable which would allow telephonic conversation to be held across the Atlantic ocean.

Professor Pupin is about thirty-five years old and is a friend of Tesla, who regards him as one of the most promising men in the scientific world.

Speaking of his invention Professor Pupin says:

"I have been at work on the invention for five years. I conducted all the experiments in this building and the boys here helped me. They deserve a great deal of the credit.

"The idea not only makes an ocean telephone possible, but it will save a fortune in the construction of long-distance land lines. Just to give you an idea, my process will effect a saving of

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$120,000 on each land circuit between New York and Chicago. The saving on every 1,000 miles of land circuit will be in equal proportion to that between Chicago and New York."

"When did you perfect the invention?"

"More than a year ago. I took out my patents only last June, but I demonstrated the practicability of the process long before that.

"The problem I had to solve was to reduce the 'capacity' so that a message could be transmitted clearly and rapidly. I discovered at the outset that the slowness of transmission was due to loss of energy by conversion into heat and otherwise. The puzzle was to preserve this energy.

"By mathematical calculation I demonstrated that this could be done by means of a 'choke' coil placed at intervals along the line. These 'choke' coils are of wire around a coil of metal. On a cable line they should be at intervals of an eighth of a mile; on land lines at intervals of a mile."

There have been two patents issued, numbers 652,230 and 652,231, covering the art of reducing attenuation of electrical waves and apparatus incident thereto, issued to Michael I. Pupin, Yonkers, New York, filed December 14, 1899, and issued June 19, 1900, serial numbers 740,238 and 740,239. They consist of a one-sheet drawing, together with six specific claims. The method of connecting inductive coils is shown in Fig. 1.

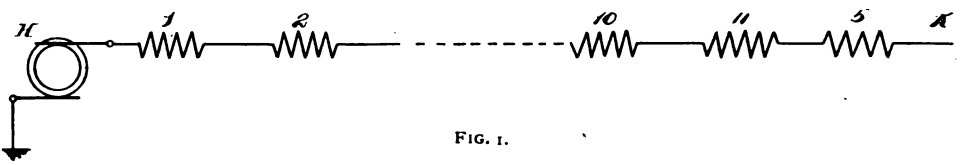

FIG. 1.

The claims briefly are as follows:

Claim 1. In a system of electrical wave transmission a non-uniform wave conductor consisting of a conductor having reactance sources distributed at points along its length in such manner that the resulting wave conductor is equivalent within proper limits to its corresponding uniform conductor, but of increased effective inductance.

Claim 2. In a system of electrical wave transmission a non-uniform wave conductor consisting of a uniform conductor along which reactance sources are distributed the total reactance, and the distance between the reactance sources being determined by the wave lengths to be transmitted, and by the required degree of approximation to a uniform wave conductor.

Claim 3. In a system of electrical wave transmission a non-uniform wave conductor consisting of a uniform conductor and inductance coils in series in it at periodically recurring points, the inductance resistance and capacity of the interposed inductance coils being adjusted in such a way as to give, with the inductance, resistance and capacity of the uniform conductor, a predetermined inductance resistance and capacity per unit length, and the distance between the interposed coils being adjusted in such a way as to equal a fractional part of one-half of the shortest wave length which is to be transmitted, substantially as described.

The other claims with this patent relate to a combination of above claims.

The other patent has but one specific claim, which is "the method of diminishing the attenuation constant of a uniform wave conductor which consists in increasing the inductance of the conductor sufficiently to secure the required diminution of the attenuation constant by distributing along the conductor inductance sources at periodically recurring points; the distance between consecutive points being such as to preserve approximately its character as a uniform conductor with respect to the waves to be transmitted, substantially as described.

Oliver Heaviside has laid down elaborate mathematical deductions showing that electrical waves in passing over conducting lines suffer a continual attenuation, due for the most part to the

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resistance of the circuit itself, but there are two other factors which tend to distort the electrical waves. All telephone waves are of a highly complex character, containing many elements of different wave length and frequency, and since the attenuation suffered by any wave is directly dependent upon its frequency and wave length, it happens that in ordinary circuit waves are not only attenuated and dampened in the amplitude of their vibration, but are also distorted by the more rapid suppression of their high-frequency elements and thus so transformed in character that they become unrecognizable as the original waves at the sending end.

The resistance, capacity and induction of a circuit bear a definite relation to each other, and if they can be so distributed that the resistance is equalized thruout the length of the circuit the waves will pass over it without distortion. This is an ideal toward which electricians have struggled.

Professor Pupin, before the Society of Electrical Engineers in session at Philadelphia, May 18, 1900, described his system and displayed diagrams illustrating the same. The diagram which is reproduced here as Fig. 2 consists of eight equal coils; that is, four coils to each side of the circuit. These coils are linked in series and the end of their circuit at one end is connected

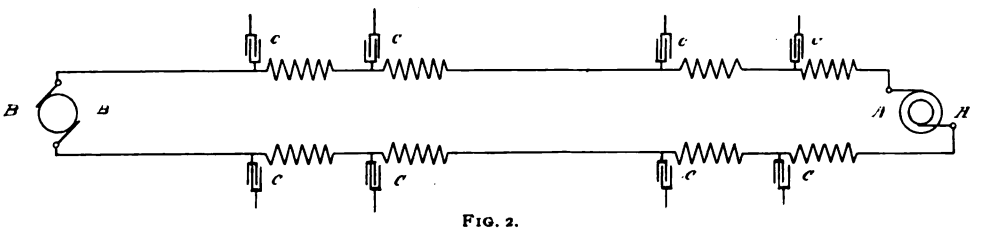

FIG. 2.

to an alternator and the opposite end to a receiving apparatus, shown as Fig. A. The alternator is marked as Fig. B. This being connected thruout the series forms a complete loop. The condensers shown, marked as C, are grounded. This allows the static or overload to become discharged thru a discharging medium balancing the self-induction of the coils. The theory of the coils is, that in long-distance messages, either telephonic or telegraphic, the cable acts as a condenser and becomes loaded, and is forced to discharge the current which causes the electrical waves to become tangled into each other. Professor Pupin's invention is to prevent this. He has provided for this in a manner similar to the circuit shown; that is, instead of using the alternator and the receiving instrument, it can be used with either the telephone or the tele-

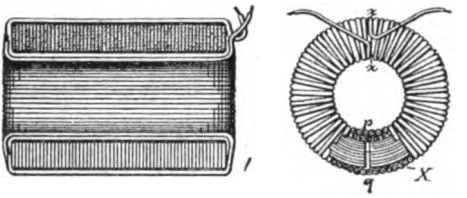

FIG. 3.

graph. The theory is that the choke coils impede each wave in a distinct form, the condenser serving to overthrow the self-induction. The trouble with this system will be the proper figuring out of the number of coils to the mile. The coils (Fig. 3) which Prof. Pupin has used are of 250 turns of No. 20 B. & S. copper wire, boiled in paraffin to close all air gaps and exclude all moisture. The patent claims, together with the patent drawing which is shown in the beginning of this article, embrace and thoroly cover the different principles that are taken up with the aid of Professor Pupin's apparatus. The claims given are the basic ones and the balance of the claims are in combination ones. It now remains to be seen whether this discovery will work out as well in practice as it will in theory, whether the line or cable can be made so as to balance perfectly and possess no self-induction outside of that utilized by the coils.

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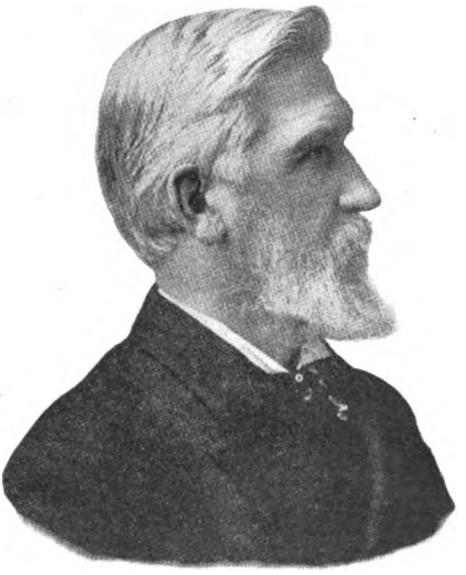
PROF. ELISHA GRAY DIES SUDDENLY.

Prof. Elisha Gray, the world-famous electrician and inventor of the telephone, who for thirty years has resided at Highland Park, Illinois, died suddenly January 20 of heart disease, at Newtonville, near Boston, Massachusetts.

Professor Gray had been absent from his home for over a year, having been engaged with Arthur J. Mundy, of Boston, in perfecting a wireless system of submarine telephoning. His latest electrical discovery recently created a sensation in the world of invention, and in the fall of 1899 he, with his wife and son David, went to the seacoast for the purpose of making experimental tests.



ELISHA GRAY.

For nearly three years Prof. Gray had been working with Arthur J. Mundy on a submarine signaling device whereby he hoped to prevent collisions at sea and also to warn naval vessels of the approach of torpedo and other submarine boats.

The idea suggested itself to Mr. Mundy during the Spanish War, when there was considerable alarm at the prospect of an attack on seaboard cities by the Spanish fleet, which was supposed to have eluded the American fleet in the West Indian seas. Mr. Mundy wrote to Professor Gray, requesting his assistance, and the two combined to invent a system by which ships could be warned from shore and by which also seacoast cities could hear vessels approaching shore under cover of darkness.

After two and a half years of experimentation an exhibition of wireless submarine telegraphy was given in Massachusetts bay December 31 last. A boat of special construction and carrying machinery for generating electricity was submerged fifteen feet. The receiving station was placed on board the steamer Mayflower, and at a distance of one and a half miles sounds from the telephone receiver could be distinctly heard.

Later experiments proved conclusively that the signals were readable at a distance of twelve miles.

Professor Gray recently declared that the invention, when put into practical use, would afford ocean vessels protection from collisions in foggy weather, and also predicted that a system would be perfected whereby warships might communicate with each other during naval engagements.

Elisha Gray was of Quaker origin, barely escaped the ministry, tried to become a farmer, and finally decided that his talents were best fitted for electrical research. Thru discouragements and rebuffs which would have caused a less determined man to seek other lines, Professor Elisha Gray rapidly worked his way into the front rank. He was born in Barnesville, Belmont County, Ohio, on August 2, 1833, and was the son of David Gray, a native of Pennsylvania and of Scotch ancestry. When twelve years old his father died and he was thrown upon the world. Apprenticed to a blacksmith, he found, after he had mastered the trade, that it was too severe for him. Then he sought an apprenticeship with a ship joiner in Brownsville, Pennsylvania, and remained there one and a half years in the service.

Falling in with the late Prof. H. S. Bennett, then a student at Oberlin College, he matriculated at Oberlin in 1857. While taking a course there he paid his

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way by working as a carpenter. His graduation was with the highest honors of his class, and while in the institution he invented nearly half the new appliances which were used in the laboratory there.

Electricity attracted his attention first when he was thirty years old, and from that time he applied himself to the scientific and practical development of the subject. His labors were crowned with many successes.

In 1867 he perfected his first device, a self-adjusting telegraph relay. The following year he engaged in the manufacture of electrical apparatus at Cleveland, Ohio, and there invented the typewriting telegraph, the telegraph repeater, telegraphic switch, the annunciator system, and several minor devices.

In 1869 he formed a partnership with Mr. E. M. Barton, now president of the Western Electric Company, of Chicago, and in 1872 moved to Chicago and organized the Western Electric Manufacturing Company, which modest concern has grown, under Mr. Barton's management, to be the largest electrical establishment in the world, Professor Gray, in 1875, retiring from active service in the company in order to devote all his time to scientific research.

It was in 1874 that he first made the experiments that led to his invention of the telephone. Noting one day, when a secondary coil was connected with the zinc lining of the bath tub — dry at the time — that when he held the other end of the coil in his left hand and rubbed the lining of the tub with his right it gave rise to a sound that had the same pitch and quality of the vibrating contact-breaker, he began a series of experiments which led first to the discovery that musical tones could be transmitted over an electric wire. Fitting up the necessary devices, he exhibited the invention to some of his friends, and the same year went abroad, where he made a special study of acoustics and gave further exhibitions of the invention, which he developed into the harmonic and multiplex telegraph.

He succeeded in sending over a wire 500 miles long nine different messages at the same moment, each having a distinct note and each capable of being taken off at any number of intermediate points by tuning the receiver to the keynote on which it was transmitted.

On February 14, 1876, he filed his famous caveat for "a new art of transmitting vocal sounds telegraphically," on the same day that Alexander Graham Bell filed his application for a patent "for the electric transmission of vocal sounds." A full résumé of this celebrated case is given in the last issue of THE TELEPHONE MAGAZINE under the title of "The Telephone Reminiscent."

In 1877, at Chicago, Professor Gray gave an exhibition of long-distance, or what was then long-distance telephony, between Chicago and Milwaukee. Musical airs were played on an instrument connected with the telephone at Milwaukee, which is distant eighty-five miles from Chicago, and clearly heard thruout a considerable hall in the latter place. These experiments also were conducted for the purpose of illustrating a lecture. Professor Gray's apparatus consisted of fifteen boxes on which were stretched musical strings connected with the telegraphic instrument; a stringless violin hung upon a long wire, acting as a sound-box. A dozen or more tunes played upon the organ at the Milwaukee end were perfectly audible to the large audience.

Fifteen years ago Professor Gray designed the underground conduit system for telegraph, telephone and electric-light wires, the first of which was laid in La Salle street, Chicago. This system has since come into almost universal use.

In the fall of 1892 he organized the Congress of Electricians, in connection with the World's Fair.

In 1893 he patented the telautograph, his most famous invention. The telautograph transmits facsimile copies of handwriting and photographs by telegraph, the receiving instrument duplicating the movements of the pencil at the other end of the wire and without the aid of an operator. In transmitting a message an ordinary lead-pencil is used. The device is one of the most

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delicate instruments used in telegraphy. In 1878 he received the grand prize at the Paris Exposition, and was also given the degree of chevalier and the decoration of the Legion of Honor. At the electrical exhibition in Paris in 1881, he was again honored with a gold medal. By Oberlin College he was given the degree of A.M. and by Ripon College that of Ph.D. He also held the degrees of Sc.D. and LL.D., was a member of the American Philosophical Society, the Society of Electrical Engineers of England and the Society of Telegraph Engineers of London.

Professor Gray's greatest prominence was gained in connection with the telephone, which has earned several men fortunes amounting into the millions, and which cost him a fortune in fruitless litigation. Tho the courts have declared against his claim to the invention, the question is one that tore the scientific world asunder, and it is safe to say that the major portion of it ascribes the honor of the invention to him. There are few men who have attained such prominence in the field of electrical science from so humble a start.

Speaking of Professor Gray Mr. Barton said:

"Professor Gray was a deep student and thinker along scientific lines, interested in fundamental principles, the details of which he left to others. Genial, kindly and of a charitable disposition, he was loved by the workmen under his direction as a superintendent, and was a general favorite among his large circle of friends. More generous than thrifty, he was always ready to assist his friends."

TROLLEY TELEPHONE.

The equipment for the new Belvidere electric line will be of the latest sort.

One feature which will prove of value is the telephone attachment to all the cars. This will allow the conductor to place himself in communication with either end of the line instantly and report accidents or delays or receive orders in case of doubt.

The wire will be strung alongside the track and each car will be provided with one instrument. A slender pole with a hook on one end and a flexible wire on the other will make the connection between wire and telephone and a push-button will do the rest.

This will obviate the necessity of a car waiting out in the country in case of a breakdown, as the conductor can report it to the office nearest and assistance can be sent at once. In case of an accident word could be sent in to secure physicians and the ambulance which would be in readiness to care for the injured.

INDEPENDENT EXCHANGE FOR GALESBURG, ILLINOIS.

The telephone war, long anticipated and long postponed, seems to be on at last, and Galesburg is likely to enjoy it.

An active canvass is now being prosecuted for subscribers for the Union Telephone Company, and names are being secured. The work along this line is being done by Lafayette Weinberg, in conjunction with Frank L. Bills, an experienced telephone man, who has recently come from a scene of extended operations in Wisconsin.

The agreement they ask subscribers to sign provides that they will make no charge for service until 500 instruments are connected up and in use in the Galesburg exchange. For the service to be given they fix the following scale of prices:

Full metallic long-distance business 'phone, $30 a year.

Full metallic long-distance party line of four 'phones, $18 a year.

Full metallic long-distance, residence, $18 per year.

Full metallic long-distance, residence party line, $12 a year.

Mr. Bills has just come from Wisconsin, where he has organized Independent exchanges in Janesville, Beloit, Racine, Delavan and a dozen other smaller cities, and the country round about them. He states that these lines are paying their stockholders all the way from twelve to twenty per cent dividends annually, and have developed the business of the towns greatly.

Please renew my subscription to TELEPHONE MAGAZINE. Can not do without it.

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HOW TO MAKE A SIMPLE GALVANOMETER.

A galvanometer is one of the most necessary instruments for a telephone exchange. The different uses it may be put to is for testing cables, leakage in switchboards, cross-connecting boards, cable heads, lightning arresters, and for testing weak places in the line and, in fact, any place where a good, reliable test is desired. Very often a cross is found which is not heavy enough to carry a generator current, but a telephonic current will easily traverse this circuit, and a galvanometer is the only instrument sensitive enough to indicate a circuit of a like nature. This plan for making a galvanometer is written in plain terms, so any one can understand it.

A. J. KUSEL.

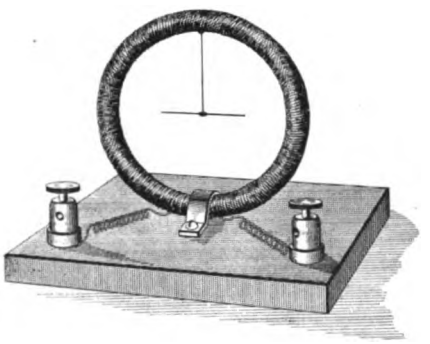

FIG. 1.

To construct the instrument (shown complete in Fig. 1) we first require about 1 ounce of No. 24 silk or cotton covered copper wire; this is wound into a ring of about one hundred turns, and either of the ways mentioned below may be adopted.

(*a*) Suitable for any one who can get access to a lathe.—A wood ring of 1¼ inches bore, 2¼ inches diameter, and ⅝ inch thick is turned, and a groove is put in it about ⅜ inch deep and ⅜ inch wide; this ring is now painted or polished, and when dry the wire is carefully and evenly wound into the groove. Two small holes had better be made thru one side of the bobbin to lead the two ends of the winding out; these ends had better be left 8 inches long; the wires may now be covered with a layer of black tape, colored silk, or simply shellac varnished. The ring or bobbin is shown in Fig. 2.

(*b*) The other way is to cut a circle of wood ⅜ inch thick and 1½ inches diameter, and then to fix on to it two thin sides and to wind the wire carefully into the groove thus formed (it is well before winding to lay four bits of thin twine in the groove crossways to the winding, and at about equal distances apart). These pieces of twine are tied when the winding is completed, and serve to hold the layers together while one side of the wooden core is removed and the coil slipped off. The ends of the coil should be near together, but should not be twisted together. Some twine is now procured (not too thick), and one end is firmly tied round the coil near its ends; a short length of twine is left over. Now the coil is tightly and evenly overwound with one layer of twine (crossways) (Fig. 1), and the end is tied to the other end which we left over for that purpose; this will look well when varnished, and a good varnish is made by mixing lampblack or fine powdered carbon with shellac varnish; this layer of twine holds the wires well together and protects them. It will be found that the section of the coil will now become practically circular.

A wood base is next cut about 3½ inches square and ½ inch thick, and is finished as desired. If our coil is of type *a*, a small bit of wood is cut about 1 inch by ½ inch by ½ inch, and the ring is glued to it and to the base (see

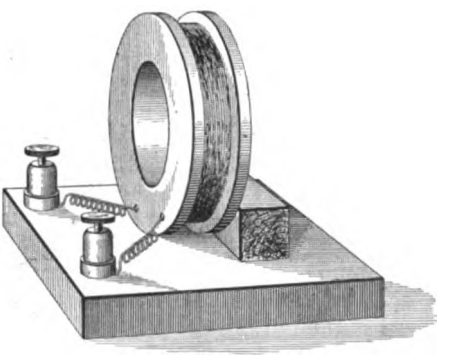

FIG. 2.

Fig. 2), the bottom of the ring being slightly flattened by filing or cutting where it is to be glued to the base. When the glue has set this will be found quite firm. It is well to put the block at the back of the ring, and to let the wires

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project in front. Each wire is now coiled neatly into a spiral (say, upon a pencil), and then is put on the bottom face of a terminal and the latter screwed down tight. Ends of wire and bottom of terminal must be well cleaned. If it is preferred, the ends of wire can be taken down underneath the base thru a small hole led in grooves to where the terminals are, and then again brought to the surface; the grooves may then be filled in with cement, such as Prout's glue. If our coil is of type *b*, the easiest way of fixing is to cut a piece of brass about 1¼ inches by ⅜ inch by ⅛ inch, and drill two small holes near the ends of it, and then to screw the coil down as shown in Fig. 1. The strip should be bent into the arc of a circle. Either way of connecting to terminals may be adopted. All that now remains to be done is to place a well-magnetized magnetic needle in the center of the coil, and there are three suitable ways of doing this.

1. For rough work (testing, etc.), mount an ordinary compass-needle, about one inch long on a fine needle point. This may be stuck, head downward, into a small piece of wood or cork, which is then cemented to the inside bottom of the coil; or, if the instrument is to have more than one kind of magnetic needle, the block should be cut to fit over the bottom of the coil, and so be easily slipped out.

2. Another way is to well magnetize a fine sewing needle (by rubbing it from end to end with one pole of a strong magnet a few times); the pointed end is broken off, so as to leave the needle about one inch long; a tiny hook of fine wire is twisted and cemented to the center of the needle, and a similar one is cemented to the inside top of the coil, or else only a small lump of cement is melted on to the latter place; a very fine thread of cocoon silk (it can be pulled from common silk) is tied to or cemented to the needle hook, and then tied or cemented to the top of the coil, or passed over the hook and cemented (it will be found a very wearisome task to handle this very fine silk, and it takes a lot of patience to tie it—in fact, it is often hard to see it at all).

3. The last method is by far the most sensitive one, and it was devised by Lord Kelvin. A tiny mirror, about ½ inch or less in diameter and very thin, is hung by means of the silk described, and on its back are cemented two or three tiny pieces of magnetized sewing needles. These pieces should all have their N. poles and S. poles pointing the same way. This may be easily arranged by seeing that the pole of a magnet attracts all the ends to be placed pointing the same way, and repels all the other ends. A dial is illustrated in Fig. 3 which may be cut out and used in making a galvanometer.

To use the galvanometer it should be turned until its needle lies parallel to the coil, or else the needle may be brought parallel with the coil by placing a small magnet on the table (not too near), and turning it till it influences the needle into the correct position (parallel to the coil). It is well to put a small glass shade over the instrument, especially if it is arranged with silk suspension. A neat shade may be formed by breaking off the stem of a

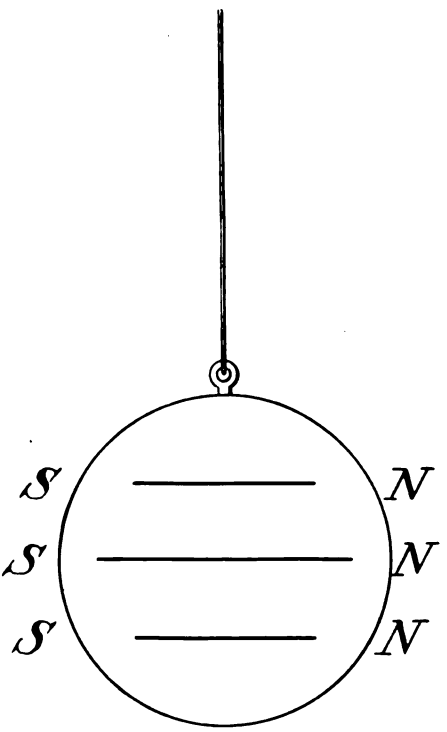

FIG 3.

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thin wineglass, and grinding the fracture smooth; this just covers the coil well. No powerful generator, such as an ordinary battery, should be applied straight across the terminals, as the effect is far too violent. The first method is suitable for testing for leaks in electromagnets, etc. (a weak cell made by a strip of zinc and one of copper, put into a solution of salt and water, may be used, and should be small —say the size of a wineglass). It may also be used for experimental work, and to show the laws of electromagnetism. It will show a deflection if a few inches of copper and iron wire are cleaned and twisted together for ½ inch at one end and the other ends are put into the terminals; the junction is now heated with a candle or a match; this is thermo-electricity.

The second method is far more sensitive, and can not well be used for rough purposes; it will show a large deflection with the above copper-iron pair, and will show a small effect if a battery, made of one drop of sulphuric acid and water, a copper wire and tiny zinc strip is applied; this is voltaic electricity. Electromagnetic induction may be well illustrated — an electromagnet (such as a bell-magnet or iron horseshoe, wound with one hundred turns of wire) is applied to the terminals and a permanent steel magnet is now moved in front of the electromagnet; at every movement the needle will give a kick. The magnets here must be some way from the instrument, or a direct effect from them will affect the needle. An assistant can manipulate the magnets at the other end of the room, while the operator himself watches the needle. This electromagnetic induction is the vital principle of a dynamo's action; in fact, the magnets here constitute a dynamo and the galvanometer a motor.

The last method requires a lamp (or candle), scale and lens for its use, and is far too delicate for anything except very feeble currents and careful hands. Fig. 4 shows the way to set the apparatus up. A box of wood or cardboard is set up in a darkened room; this has a slot cut in it about ¼ inch wide, and a lamp is placed behind, the rays of which pass thru the slot, and then thru a convex lens onto the mirror. From the latter they are now reflected back on to a white scale put to catch them; the lens is moved until it brings the rays on a focus on the scale, and, if a very definite line is required, a thin wire put vertically in the slot will come out clear and sharp on the scale. When hunting for the spot, when setting up apparatus, it will be found convenient tc explore with a sheet of white paper or card. To stop the needle vibrating quickly after it has once been set in motion, a weak barmagnet held in the hand and moved so as to act on it (the needle) will bring it to rest very quickly after a little practice; it can be slowly taken away as needle comes to rest. The lens may be abolished if a very sharp spot is not required.

Almost anything which a galvanometer will show can be shown here. The scale readings are directly proportional to the currents producing them, and are proportional to the volts applied if a coil of high resistance is put in series with the instrument. A few turns of wire slid up or down the pole of a magnet will produce a kick at each move (electromagnetic induction). A copper-iron pair heated with the hot hand or breath, one cell applied thru the operator's

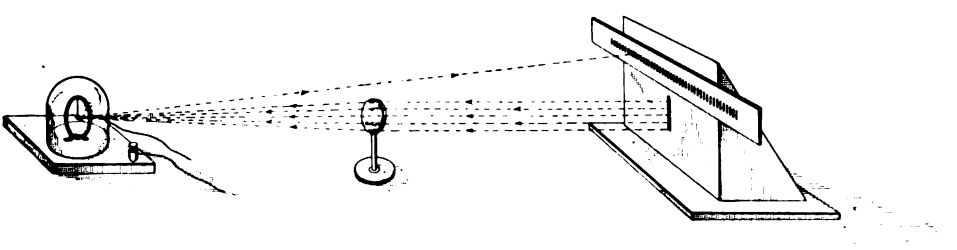

FIG. 4.

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hands — one pole of cell is applied to galvanometer, the other is applied to his left hand and a wire is put connecting his right hand to the other terminal of instrument. A good contact should be made to each hand by holding two pieces of metal, such as a hand vise in one hand, and a pair of pliers in the other, the wires being held tight to the metal; this will produce an effect. Even a carbon or copper plate held in one hand and a zinc in the other will produce a displacement of the spot (the hands should be damp). The operator, in this latter case, forms a part of a battery.

WISCONSIN TELEPHONE FEES.

The license fee which shall be charged telephone companies shall be a percentage of the gross receipts ranging from a minimum of three per cent to a maximum of five per cent, graded and classified as follows: Three per cent on the gross receipts of all telephone companies whose gross receipts per annum shall not exceed $25,000; the rate thereafter to be increased from the minimum rate of three per cent by adding thereto one-tenth of one per cent for each additional $7,500 of gross receipts over $25,000 until gross receipts of $100,000 are reached, when the rate will be four per cent; thereafter to be increased from four per cent by adding thereto one-tenth of one per cent for each additional $10,000 of gross receipts over $100,000 until $200,000 of gross receipts are reached, when the rate will be five per cent; then five per cent on the gross receipts of such companies whose gross receipts per annum shall exceed $200,000.

SETTLES FOR $1,500.

Herman Bonsack's case against the Wisconsin Telephone Company has been settled by the company paying him $1,500. It was a peculiar accident that brought on the injuries of Mr. Bonsack. He was driving down town when a glass insulator was negligently thrown to the ground by a telephone man on top of a pole and the glass struck Mr. Bonsack's horse, scaring the animal. It ran away, throwing Mr. Bonsack out and injuring his spine. He asked for $3,000.

PAINT FOR PRESERVING ZINC.

Zinc which has to be painted should be first treated with the following solution; if this is done, any oil paint will stick to it almost indefinitely and will not flake off under the hottest sun: Dissolve in 32 pounds of distilled water ½ pound of chloride of copper, ½ pound of nitrate of copper, and the same amount of sal ammoniac. To this add 1 pound of ordinary commercial spirits of salts. Paint over the bright zinc with this, using a brush which can be thrown away when done with, and let it dry for twenty-four hours.

PAPER FOR TESTING POLARITY.

In the absence of properly prepared pole-testing paper, litmus paper can be used with equal success. By wetting some blue litmus paper and placing the two wires of a circuit in contact with same, the negative wire turns the paper brown and the positive turns it a darker blue than its ordinary color. On trying the same experiment with light brown or red litmus paper, the positive wire turns the paper a dark blue. Blue litmus paper may be had at almost any drug house.

TO PREVENT IRON AND STEEL FROM RUSTING.

Dissolve one part of white wax in fifteen parts of benzine and apply a thin coating to the surface of the metal. This is easily removed when required.

WIRELESS TELEGRAPH SERVICE FOR LIGHTHOUSE.

A report from Washington states that the lighthouse board is making an effort to secure an appropriation for equipping several lightships and lighthouses with wireless telegraphy or telephony. The board believes that this system will prove to be of invaluable service in communication between lightships and lighthouses and in the saving of life. It is proposed to introduce the system gradually and an appropriation of $25,000 is wanted for a beginning.

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REPORT
OF THE
Inter-State Association
Held at Kansas City, Mo., January 15, 1901.

The meeting was called to order by the President, Mr. Fred R. Ba Som, of Joplin, Missouri, at 2:10 P.M.

The President: Gentlemen, in calling this annual meeting of the Independent Telephone Association to order, I want to congratulate the Independent telephone people upon the representation that is made here today. There is not any doubt but what the business that may be transacted at this meeting will be beneficial to the entire Independent telephone interests of the country.

When the holding of this meeting at Kansas City was suggested I, for one, was opposed to it upon the theory that Kansas City was opposed to Independent telephone people; but since the meeting at Manhattan I have become thoroly satisfied that whenever an Independent telephone company starts here with sufficient capital to connect with all of our toll lines, that Kansas City is ready to grant them such privileges and franchises as they are entitled to. I can see no reason why that should not be true, because the fact of putting in an Independent telephone exchange in this city would mean a capital of $250,000 to start with, and it seems to me that the business interests of Kansas City should want to bring an investment of that amount to this city. From a business standpoint, it would be a great thing for this municipal organization to have an Independent telephone exchange in this city. For a business enterprise of the Independent telephone exchanges, it would certainly be a good business proposition if we could connect with Kansas City.

There is no doubt but what Kansas City is to be the Chicago of the West. There is no doubt but what the business men of Kansas City would take a telephone if they could be connected with the business interests of the country, from the fact that the business people of Kansas, Arkansas, Oklahoma and the Indian Territory have at least three exchanges for each and every one that the Bell people have.

And when you take into consideration that in America today there are over four thousand Independent telephone exchanges that have sprung into existence within the last four or five years, and that millions of dollars of capital are invested therein, and that the business is in a prosperous condition, there is no good reason why Kansas City should turn its back upon a proposition of that kind. And, as I said in the start, I believe that whenever the people go before the council of Kansas City with capital behind them to build an exchange, Kansas City will do what it ought to do.

Now, as the business of this meeting is somewhat voluminous, from the fact that there is a new set of officers to be elected today and other business connected with the organization to be transacted, the secretary has seen fit to have the minutes of the last meeting printed, so as to avoid spending unnecessary time in reading them before this meeting. Copies of these minutes will be furnished to each one of the members that they may become familiar with what has been done. We have also today to make arrangements for the next meeting.

The new members will please come forward and give their names to the secretary, and I will state here that this association is for the purpose of getting together upon a uniform system of construction, materials, 'phones, fixing toll rates and rates between individual exchanges.

The following companies, by their representatives, gave their names to the secretary and paid the membership fee:

J. H. Goodwin, president California

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& Bunceton Telephone Exchange, Bunceton, Cooper County, Mo.

Ed T. Purcell, manager Saline County Telephone Co., Marceline, Mo.

F. W. Daugherty, Concordia, Kan.

Shem Zook, Quick Telephone Co., Harrisonville, Mo.

A. R. Champlin, Newton Telephone Co., Newton, Kan.

George W. Schweer, Missouri Union Telephone Co., Windsor, Mo.

William F. Sikes, Wellington Telephone Exchange, Wellington, Kan.

Fred R. Ba Som, Joplin Telephone Co., Joplin, Mo.

Hickman & Perkins Telephone Co., Independence, Kan.

J. O. Woods, Seneca Telephone Co., Seneca, Mo.

C. H. Wallis, Central Telephone Electric Co., St. Louis, Mo.

H. Hodges, Paola Telephone Co., Paola, Kan.

E. F. Walker, manager Nevada Telephone Co., Nevada, Mo.

Theodore Gary, Macon Telephone Co., Macon, Mo.

U. S. Hannan, Iola, Kan.

U. G. Honnell, Citizens Telephone Co., Excelsior Springs, Mo.

C. S. Penwell, Eureka Telephone Exchange, Eureka, Kan.

J. E. Taylor, B. R. Electric Co., 613 Delaware street, Kansas City, Mo.

W. N. Wicks, Glasgow Telephone Exchange, Glasgow, Mo.

F. H. Whitaker, telephone electrician, 614 West Sixth avenue, Topeka, Kan.

W. P. Patterson, Kansas Telephone Co., Fort Scott, Kan.

F. S. Travis, Northwest Missouri Telephone Co., Tarkio, Mo.

D. M. Martin, Oregon, Mo.

G. A. Wadleigh, Joplin, Mo.

P. Parker, Liberty (Mo.) and Olathe (Kan.) Telephone Co., Liberty, Mo.

J. M. Kennedy, Kirksville, Mo.

George W. Crawford, Girard, Kan.

G. H. Spangle, Chetopa Telephone Co., Chetopa, Kan.

A. H. Tibbey, Washington, Mo.

W. W. Dilworth, Beloit, Kan.

Sim Baer, Topeka, Kan.

E. H. Berry, Atchison, Kan.

C. E. Betts, Fayette Telephone Co., Fayette, Mo.

W. H. Newberry, Monett, Mo.

A. J. Kusel, Electrical Engineering Publishing Co., Chicago, Ill.

Proceeding with the order of business, the following officers were elected for the ensuing year:

President, Mr. Fred R. Ba Som, of Joplin, Mo.

Vice-president, Mr. E. H. Berry, of Atchison, Mo.

Secretary, Mr. G. F. Armstrong, Pierce City, Mo.

Treasurer, Mr. G. A. Wadleigh, of Joplin, Mo.

President Ba Som: We come now to new business. Is there anybody present whose name already appears as a member of this association who has not registered here today? We want the names of all the Independent people to show up on these minutes.

Mr. Gary: I move you that the roll be called, and that each gentleman present respond, giving the number of 'phones he has at work, the number of miles of toll lines, and the number of direct connections made from his office.

Motion seconded by Mr. Woods.

Mr. Armstrong: I would like to amend that by asking that each gentleman present write that information and hand it in. It will take less time.

Mr. Gary: The amendment is accepted.

Motion as amended adopted, and the following list was filed with the secretary:

1. Macon Telephone Co., Macon, Mo., Theodore Gary: 472 'phones, 103 miles toll line, 44 towns connected — exchanges.

2. Northwest Missouri Telephone Co., Tarkio, Mo., F. S. Travis: Tarkio 110 exchanges, Rock Port 55, Mound City 110, Oregon 125; 300 miles toll line, 35 stations.

3. Seneca Telephone Co., Seneca, Mo., J. O. Wood, manager: 43½ miles toll line, 86 phones, 8 stations.

4. Quick Telephone Co., Harrisonville, Mo., Shem Zook, president: Recently organized; no lines in operation.

5. Bunceton Telephone Co., Bunceton, Mo., J. H. Goodwin, president: Bunceton exchange, 95 'phones; California exchange, 125 'phones.

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6. Nevada Telephone Co., Nevada, Mo., E. F. Walker, manager: 353 'phones.

7. Missouri Union Telephone Co., Windsor, Mo., George W. Schweer, manager: 516 'phones; 2 exchanges — Windsor and Clinton; 84 miles metallic circuit toll line, connection Clinton, Lewis Station, Calhoun, Windsor, Greenridge, Fort Lyon, Santiago, Polo Pinto, Lincoln, Owsley, Sutherland, Post Oak, Shawnee Mound, Quarles, Knobnoster — 15 towns.

8. Beloit Telephone Exchange, Beloit, Kan., W. W. Dilworth, proprietor: 270 'phones in operation, 75 miles toll line, 10 towns.

9. Newton Telephone Co., Newton, Kan., A. R. Champlin: 330 'phones, 60 miles toll line, 12 stations.

10. Paola Telephone Exchange, Paola, Kan., H. Hodges: 190 'phones, 35 miles toll line, connecting Paola, Osawatomie and Ottawa, Kan.

11. Concordia Telephone Co., Concordia, Kan., F. W. Daugherty: 300 'phones, 60 miles toll line, 10 towns connected.

12. Ottawa Telephone Co., Ottawa, Kan.: 550 'phones, 30 miles toll line, 6 stations.

13. Kansas Telephone Co., Fort Scott, Kan.: 365 miles toll line, 48 stations.

14. Mutual Telephone Co., Fort Scott, Kan.: 450 exchange 'phones, no toll lines.

15. The Northern Kansas Telephone Association: 965 'phones, 250 miles toll line, 45 towns connected.

16. Hickman & Perkins Telephone Co., Independence, Kan.: 160 'phones, 50 miles toll line, 8 stations.

17. Chetopa Telephone Co., Chetopa, Kan., G. H. Spangle, manager: 105 'phones, 55 miles toll line, 7 towns.

18. The Atchison Telephone Co., E. H. Berry, secretary and manager: 900 'phones.

19. Eureka Telephone Exchange, Eureka, Kan., C. S. Penwell, proprietor: 156 'phones, no toll line.

20. William F. Sikes, Wellington, Kan.: 180 'phones, no toll line.

21. Joplin Telephone Co., Joplin, Mo., Fred R. Ba Som, president; Z. H. Lautermilk, secretary: 1,100 'phones, about forty miles toll line, direct connections with Webb City, Carterville, Carthage, Neosho and Galena.

Mr. Schweer: I move you that each member furnish the secretary a map of his exchanges and telephone connections so that a complete map may be made up and a copy furnished to each member of this association.

Mr. Kusel: I move you that the map be assigned to us as our work in this connection. The map would be published in our magazine and each member of the association could subscribe for the paper. We will agree to do this work if the secretary will forward us these maps as sent to him. Our draftsman would do the work after the material was furnished him. Some correspondence between our house and the secretary of your association would be about all the trouble and expense there would be connected with it.

Various plans were suggested as being most likely to furnish the data required to make a complete map with no missing links. A motion finally prevailed to the effect that the secretary be instructed to request all of the Independent telephone exchanges within his knowledge to send in maps showing location of exchanges and toll lines, where toll lines leave the cities, etc., this material to be furnished the TELEPHONE MAGAZINE to be printed in that magazine, to occupy one page of the paper.

Mr. Crawford, of Girard, introduced the question of toll-line fees for messenger service.

Mr. Ba Som: This is a question that has been before us ever since this organization has been in existence. There are some towns having messenger service entirely separate from the telephone service. My experience has taught me that there is as much money at one end of the line as there is at the other. I believe if we would adopt the same system with reference to the messenger service that we have in the telephone connection that we would come about as near doing right as in any other way. Let each one keep what he gets. It saves bookkeeping and it saves expense.

Mr. Patterson: I do not believe that

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plan would work justice to all. You take a town that has an exchange. I do not believe there is on an average 50 cents paid for messengers during the month, because they have so many telephones, and if a party can not be reached direct, he can be reached thru his next door neighbor. In Fort Scott it is only once in a long while that we have to hunt up a boy and send him out. But take the little town of Moran, for instance. The messenger fees will run up to 90 cents, $1, $2. You see this would work an injustice to the small towns which would have many messenger fees to pay, while those with more exchanges would not pay any. It does not seem to me that such an arrangement would be fair, equitable and just to all concerned.

Mr. Crawford: How would it do to have the plan as suggested apply only to those that have exchanges? That would seem to be fair.

Mr. Hodges: We have so many toll line companies and one company can not regulate another company's business. I do not think this association has any right to attempt to regulate this matter for any of the companies represented here.

Mr. Hannan: One difficulty in adjusting this charge is that some stations are operated by agents who get a commission on the business done. To give each person all he collects would work a hardship on many agents, and be a temptation to some of them to charge a messenger fee whether they sent a messenger or not.

Mr. Gary: When the messenger fee is 10 cents we keep it and make no accounting. When it is more than that, as it is when we have to send a man with a horse to the country, then we collect from one another.

Mr. Spangle, Chetopa: We communicate with Messrs. Hickman & Perkins, also with the Indian Territory Company. There is no account kept of 10 cent charges for messenger service. When it is 25 or 50 cents we collect from each other.

The same custom was reported to be in use by other companies. Mr. Champlin stated that at the last meeting of the Kansas Telephone Association this matter was discussed, and under the system adopted at that time each company gets its share. He believes that it is safe to follow the example of the great transportation companies in this matter.

Mr. Schweer: I believe the principle advocated by the most of us here works perfectly in cases where there are only two connections, but if I have a line running north of me a hundred miles, and another on the south a hundred miles, what am I going to get out of the business that originates on either one of the hundred miles north or south of me?

Mr. Woods: That was discussed at our first meeting and a committee appointed to formulate some plan which has been reported.

Mr. Ba Som: The present discussion relates to messenger service.

Mr. Champlin: If you make one charge you might just as well charge all of it, because it is the evident desire on the part of these gentlemen, as I understand it, to get rid of the bookkeeping. It is no harder to keep one part of it than to keep it all. Then each one gets exact justice.

Mr. Gary: If that matter is disposed of, I would like to ask what is the practice of members in regard to calling people to the telephone for other lines. We are not allowing the Bell people to use our service to call people to their telephones.

Mr. Hannan: I would like to ask the gentleman if he is able to stop it altogether. You can tell the Bell people that you do not like their way of doing, but that does not have much effect on them.

Mr. Crawford: We have in our town a Bell toll station in a drug store, and my subscribers are used to call people for them. I can not help myself, except by taking the man's telephone out.

Mr. Champlin: In our town we have a Bell toll line, and we rent them an instrument, for which they pay us the regular rate. At Guthrie the Independent company rents a Bell telephone. I was talking with one of its managers and he said that under the public

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utility laws a telephone company could not refuse to rent a telephone to any company.

Mr. Gary: I understand that.

Mr. Ba Som: You can stop everybody from talking over your 'phones who is not a renter. We have never charged the Bell people any higher rate than the regular one, on the theory that we have to treat everybody alike.

Mr. Gary: You can charge whatever rate you please, provided everybody of that class gets the same rate. Another matter, I would like to ask, what is the practice in working with the Western Union Telegraph Company? How do you get your pay? Most of you have lines running out that they do not reach.

Mr. Ba Som: Perhaps I might be able to throw a little light on that proposition, inasmuch as I have been attorney for the Western Union Telegraph Company for the past fifteen years. The idea of the Western Union Telegraph Company is to get telephone service on a commission basis, but in Joplin we have always refused to put in a telephone in the Western Union Telegraph Company's office and take a commission on the business. Finally after a good deal of correspondence with Mr. Farren, the general attorney of the company in New York, he recommended the management at St. Louis to take a telephone in the Joplin office at the rate of $2.50 per month. There is no reason why we should do any other way from the fact that they can not force us to put in a telephone. After we got 800 or 900 subscribers they put in a telephone on a basis of the usual rate, namely, $2.50 per month. And I think that will be the experience of every one; that they will come to your terms the same as any other subscriber.

Mr. Champlin: We have some stations that the Western Union Telegraph Company does not get into, and they take these stations and mark them by three stars to show that they are telephone stations, and the telegraph rate is made to the nearest town, and our charge for telephone service in addition so that an operator in Kansas City receiving a message can tell by consulting his book just what it will cost to transmit it to any one of our stations.

Mr. Armstrong: I would like to say a word about messenger tolls. I believe the time has gone by when we can afford to do business in a loose way. We have this interchange business in accordance with a written law of our organization. Now some party has built a toll line into Carthage which in some irregular way connects with our system. They get in there sometimes and we do not know it. The understanding is that the minimum rate is 25 cents; the Carthage exchange people charge 15 cents coming our way. We charge 25 cents. We are building a metallic circuit toll line into Carthage from Aurora, Missouri, and we do not propose to do business on that kind of a basis. I feel that we ought to refer this matter of rates to a good business committee and arrange an equitable system of tolls all over this section, wherever we are connected, and let it be on a mileage basis, which is the only fair way to do it.

Mr. Gary: I believe the Independent exchanges are making a mistake in going into the toll-line business until there is some system devised among ourselves in regard to it. How are we going to get up an interchange system that will make the business profitable? That is the point I would like to hear discussed.

Mr. Schweer: I believe there ought to be a board of traffic managers, or whatever you choose to call them, that would have authority to regulate the matter of charges between different companies. In fact, I make a motion that a board of three be accredited by this association to act as a grievance committee, or board of traffic managers, or whatever name you may choose to call it.

Motion seconded.

Mr. Hannan: We are getting back to where we started from. There are two ways of dividing the profit; one is by keeping what we get, and the other is dividing pro rata according to mileage. Either one is fair, depending upon an agreement between the parties. It would seem to me to be impossible to

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make a rule that would be really binding. It seems to me that the only way ever to bring this to an even basis would be to have the management of the toll lines under one general company. There is no doubt but that has been a powerful leveler with the old companies. While an agreement would be desirable, in view of the impossibility of enforcing it, it would seem useless to discuss it.

Mr. C. E. Betts, of Fayette, explained the difficulties along this line encountered by his company in Boone County, Missouri.

Mr. Schweer stated that a charge of 10 cents for each out-of-town message had helped solve the difficulty of having the line tied up so much of the time. People had complained at first, but business men soon found that under such an arrangement they could get the line when they wanted it, and it seemed satisfactory to the public now.

President Ba Som: On this proposition I would like to suggest that the difficulty with the Independent people is that about 85 per cent of the toll lines we are now using are not what they ought to be. They are simply lines of wire put on native poles, some of them not grounded and many defects exist. I believe the time will come when the toll-line business will have to go under independent management, separate from the exchanges. I think that will be necessary from the fact that nothing but good construction can do a toll-line business. Where there is an exchange that is not up to standard in construction it will simply have to leave the toll line out until it is in condition to build a system that will be useful. I believe the best thing now is to let the man who receives pay for the message keep it, and that this should apply to messenger fees as well. I would like, above all things, to see the toll lines put in good shape.

Mr. Champlin remarked that some time somebody will build a toll-line system that will cover all this territory, but it does not seem advisable for us to discuss that matter, unless there is an organization ready to take hold of it. We do not want to advertise to the Bell people that we are not able to give just as good service over the toll lines as they are.

Mr. Armstrong: I believe that the most of the people here have good toll lines — with the exception of the President. (Laughter.)

Mr. Patterson (Fort Scott): I believe that the toll lines that are being built are nearly all good lines. They are being built of iron, most of them, but I believe they are all right.

Mr. Champlin: Out in Kansas, we are waiting on Kansas City. Whenever Kansas City has an Independent telephone exchange, I do not think it will be any trouble at all to sell stock enough to the various Independent telephone exchanges to build a system of long-distance telephone lines to transmit our messages. Of course the matter of details would have to be worked out, but I believe that such a company could be organized and the means raised out in Kansas to build this line right now if we had an exchange in Kansas City. And I presume the same thing is true in Missouri.

President Ba Som: The next thing in order of business is deciding upon the place of holding the next meeting.

Joplin was proposed by Mr. Wood; Mr. Armstrong suggested Monett, Missouri, "a town that has more telephones in accordance with its size than any other town in the world; a town of 3,000 people which has over 500 telephones."

Kansas City was mentioned by Mr. Gary and was referred to by Mr. Champlin as "the place that pays more for its telephone service than any other town within our jurisdiction." Several other places were proposed, but all were withdrawn with the exception of Kansas City and Joplin, Kansas City finally being decided upon, the date to be some time in July next, as fixed by the officers of the association.

Mr. Schweer moved that a committee of three be appointed by the president of the association to confer with the Kansas City Board of Trade in the interest of granting a franchise to an Independent company, should one be asked for.

Motion prevailed.

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Telephone Magazine

THE ONLY INDEPENDENT TELEPHONE PAPER IN THE WORLD.

TEL. CENTRAL 2641. MARQUETTE BUILDING, CHICAGO.

SUBSCRIPTION:

One year, United States and Canada, $1. One year, foreign countries, $1.50. Single copies, 10 cents.

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Published on the 1st day of each month.

ELECTRICAL ENGINEERING PUBLISHING CO.

JOHN C. McMYNN, PRESIDENT.

No corporation, firm or person either directly or indirectly interested in the production or sale of telephones or telephone materials of any sort has any connection, editorial or proprietary, with this publication.

THE inventor of the telephone is dead. In the demise of Prof. Elisha Gray the world has lost one of its foremost inventors and electricians of the past century; a kindly, scholarly, large-minded man whose services to the electrical world command a place in the Hall of Fame.

We hope to see his name and bust appear among the eleven Immortals yet to be chosen for that great honor, and while doing our part toward this, we extend our sincere sympathy to his family and his friends.

PROFESSOR PUPIN has sold to the Bell Company his patents covering ocean telephony and long-distance transmission overland for $200,000 and a yearly contract of $7,500 for the life of the patent. The price paid indicates their value. It looks as if nobody else had a chance to buy. As the Independent companies have always improved on the Bell methods it remains for some bright mind in the Independent field to either invent an improved system on similar lines or to knock out all the props at once by a practical wireless system without any cables or choke coils. This is quite a proposition, but we simply propose and leave it to Heaven and the Independents to dispose.

WE welcome a new publication called *Telephony,* an illustrated monthly telephone journal which we review elsewhere in this issue. In the past century we have seen a number of publications enter the Independent telephone field, and after a brief run of a few months fade away. The field is growing broader every day and there is ample room for intelligent telephone literature. Any good publication will help all of us. We wish *Telephony* a share of our success.

ONE developed evil the small exchange has to contend with is that of making arrangements to receive and give connections to farmers' lines. On most of these the construction is poor and the 'phones are of the department-store variety. The exchange manager

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is forced to give connection to these farmers' lines by his local subscribers. The farmer builds into town with his rusty iron wire, comes into the exchange and asks for switchboard connection for about 50 cents per month. The exchange manager tells him that he can not give him connection. The farmer goes to the local merchant and says: "I have got a telephone line and your telephone exchange man won't give me any connection with you. What are you going to do about it?" The local merchant then goes to the exchange manager and says, "unless you give the farmers' line connection, you can take my 'phone out." The exchange manager is then forced to arrange some satisfactory means of connecting up the farmer. The farmers' line is a party line of say ten or twelve 'phones, and he wants connection to the entire ten or twelve for about $1.50 per month. He uses the argument that he has the 'phones and lines all up, so he ought to be able to get connection for about that price. If the exchange manager does connect up to his poorly constructed line with his cheap 'phone, it will give him more trouble than fifteen lines of his regular subscribers. There is but one way to combat this evil. When the exchange manager finds in his locality a number of farmers who want to be connected up to his local exchange he should make them some special inducement; that is, he would give them 'phone service if there were eight of them for $1.50 per month, and if there were ten of them for $1.25, and the same way all the way up, using the same basis until he got as high as sixteen 'phones. This number of 'phones is as many as ought to be strung on one party line. He can well afford to build eight miles of line for a rental of all the way from $8 to $14 a month; that is about the only successful way to remedy this trouble. Now suppose that the farmers have already constructed their line and have their 'phones in working order. The only way for the manager to do is to buy their lines outright, or on time. If it is impossible to buy the line, which it has been in some cases where the farmers have refused to sell the line and went in and organized what they call a "mutual company," where each man pays for his line and instrument and donates so much toward supporting the exchange, which is about 25 cents per month, the exchange manager must now be able to offer something more than the mutual company, and that is, satisfactory service. In the long run, he will find that by closely following up the lines which are laid out to run a good exchange on, is to give good night and day service with good toll connection. The mutual company does not give good service because its lines are usually poorly constructed and very badly kept up, and for that reason if a local exchange is up to the standard, and the manager is wide awake he need have no fear of the evil of farmers' lines, particularly if he takes time by the forelock and builds them first.

THE exploitation of Mr. Nikola Tesla in the yellow papers of the world can have done his reputation no good. We regret that this class of sensational report has now been taken up to announce the receipt by Mr. Tesla of a mysterious message from Mars. The message is, of course, meaningless, and the grounds for believing that any signal from space has been received most obscure, but the above scientist continues to furnish additional statements to the reports on the matter. It is pitiable to see the engineer who invented the multiphase system of power transmission, and who

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has done such valuable original work for other departments of electrical engineering so fond of the cheap notoriety to be gained by sensational paragraphs in daily papers.

DECISIVE and immediate action by all Independent companies is required to meet a threatening situation.

A prominent financial journal recently contained the startling statement that the Telephone, Telegraph & Cable Company was probably organized for Bell interests for the purpose of securing possession of several large telephone properties, after certain disagreeable elements were eliminated. A few days later it announced that the capital stock of the five Bell licensee companies known as the Erie system, namely, the Cleveland, the Michigan, the Wisconsin, the Northwest and the Southwestern Telephone companies, had been transferred to the Old Colony Trust Company, of Boston, as collateral for a loan of several millions, and that "these companies will hereafter be operated in accordance with the approved policy of the parent Bell organization."

This transfer takes from the Cable Company the cream of all its holdings and leaves only fourteen small telephone properties on its list. Some among these fourteen are purely paper companies, having few tangible assets, while the physical condition of some of the other companies has so depreciated since passing into the hand of Mr. Latta's Cable Company that a marked decrease in the number of subscribers has resulted, followed by a correspondingly large increase in the number of Bell subscribers, and, in three cases, by a restoration of Bell rates — facts that are the more surprising in view of the strength that the Telephone, Telegraph & Cable Company was so widely heralded as bringing into the Independent telephone movement. Needless to say that in place of strengthening the Independent movement, Mr. Latta's Cable Company's actions have so weakened the Independent movement in the estimation of large investors that a year of earnest effort combined with broad business judgment will be required to undo the wrong.

Hence it is a question with many genuine Independent men whether the Cable Company will long continue in existence, now that its mission has been accomplished so satisfactorily to Bell interests. And, if its career is to end, will its constituent elements be quietly transferred to its master? Or will they be offered at a bargain-counter sale, now that its master has gained the upper hand in their respective localities?

There is good reason for believing that Bell interests have heretofore played similar games to the discomfiture of the Independent movement; furthermore, that a new movement has been planned and will shortly be heralded as a "genuine Independent syndicate," yet having for its object the same disastrous ending that has followed the acceptance of Latta's Cable Company as an Independent member of the National Association.

Thus the time is ripe for all genuine Independent interests to get together and act as a unit in formulating a strong, dignified, conservative policy for future guidance, that will appeal to capital, as well as to the public.

That action of this character is absolutely essential must be apparent to every thoughful reader who recalls the fact that less than five per cent of the Independent exchanges were represented at the last annual meeting held in Cleveland, where representatives of the Cable Company were shown every cour-

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tesy and placed on the more important committees, regardless of the protests of old-time genuine telephone men, some of whom were even then being knifed to the heart by the same Cable Company whose representatives the association found delight in honoring.

While the mistake was natural it only emphasizes the present situation, which is one that must be met.

ADOPTED METERS.

The Martin Telephone Company, of Webster City, has adopted a telephone meter and will install a measured service. The system will be as follows: A regular rate will be charged for residence 'phones, the rates allowing 200 outgoing calls per year, no charge being made for incoming calls. All calls in excess of the prescribed number will be charged 5 cents extra. The Martin Company is one of the first Independent companies in the United States to adopt the system and it is expected that it will largely increase the list of 'phone subscribers.

TELEPHONE COMPANY WINS.

Judge J. A. Evans brought the trial of the Central Printing & District Telegraph Company, which was being prosecuted in the Criminal Court recently for maintaining a nuisance, to an abrupt end by giving the jury binding instructions to find in favor of the defendant. The telephone company was charged by Andrew Kunze with placing a telephone pole on his property at 1202-1204 Middle street, Allegheny, in such a manner as to obstruct the free passage of pedestrians and within a short distance of his coal hole. This will establish a desirable precedent in similar suits.

A QUIETUS.

Owing to the regaining control by the Bell people of the Erie Telephone Company the Wisconsin Telephone Company has shut off entirely all its construction work in the State of Wisconsin. The men have been paid off and discharged. The company will complete the tunnels in course of construction, but no more new work will be started, and the many new exchange buildings planned thruout the State will not be built now.

It is just possible that the change in control of the telephone company may mean an advance in telephone tolls as soon as the present contracts have expired.

The Wisconsin Telephone Company was started originally with home capital and Henry C. Payne and Frank G. Bigelow were among the large stockholders. A few years ago these men sold out to the Erie people, who bought up various systems until they finally covered a large part of the country.

BELL ARGUMENTS WELL ANSWERED.

The Bell Telephone Company evidently does not intend to allow the city of Toronto to establish a municipal telephone system without a fight. In response to the city council's circulars asking citizens to sign contracts to take municipal telephones for three years at $30 a year for business places and $20 for residences, the company has issued a circular to subscribers in which it states that such a scheme will involve the city in a heavy loss.

The best the city could do would be to divide the field with the Bell Telephone Company, it says. The municipal system will be a competitor, not a successor. Then, again, the municipal system will be local, and merchants who want to make connections with the 35,000 telephone stations in Ontario, Quebec and the United States must put in a Bell telephone. The Company submits that dual telephone systems have been a failure wherever tried, and asks citizens to weigh the question before signing contracts.

Alderman Urquhart, the chief promotor of the municipal telephones, has replied to the circular. The Dominion Government, having refused to enforce the act against raising rates, he says, the only recourse is a municipal system. The long-distance 'phones cut a very small figure, in his estimation, as there are but sixty long-distance

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'phones in Toronto, and the Bell Telephone Company's reports show that only 2½ per cent of the messages are long-distance ones. Besides, this difficulty will be surmounted in time by connecting Toronto with other municipalities which will follow her lead. Less than three per cent of the Independent telephone systems in the United States have been failures. More than $100,000,000 is invested in Independent telephony in the United States, and the business is carried on in 3,000 exchanges. The Bell Telephone Company is practically a monopoly in Canada, and if a man loses his job he must go out of Canada to get another. The company neither buys nor manufactures goods in Toronto, and does not pay adequate taxes on the plant of which it is the owner.

A GOOD REFERENCE CASE.

The East Tennesse Telephone Company, controlled by the Bell, has reduced its rate in Lexington, Kentucky, to $12 a year. This action has caused many expressions of commendation for the Independent Fayette Telephone Company, whose strong fight caused the reduction. The manager of the Fayette Telephone Company, when asked what effect it would have on the home company, said: "It is just what we expected, except that we thought the East Tennessee would make a greater reduction. They offer now a grounded circuit for $12 a year; they still charge $42 for a metallic circuit in a residence and $54 for a metallic circuit in a business house. The Fayette will put in a metallic circuit in a residence for $18 a year and in a business house for $30. In most places the Bell Companies give away their service after an Independent company has been started, and doubtless the East Tennessee will also do so after we get started and the people will see the difference between the service we will give for $18 and $30, and the service the Bell has been giving for $24, $36, $42 and $54. They will have to give it away to keep any subscribers, and it is the realization of this that makes them make this bluff at cutting rates now. Of course, if they could keep us from building or from succeeding after we did build, they could and would put the rates back, or increase them, and the people would have the same service as they have had. Their cutting rates now is the best thing that could happen for us; it shows the people how they dread having us erect a good exchange and giving good service, and tho we have made no thoro canvass of the town and are not going to for some time, we have gotten nearly a hundred new subscribers in the past twenty-four hours, a total of over five hundred. As it is now with this cut of the Bell's a business man has to pay $36 for a grounded circuit telephone in his store and $12 for a grounded circuit in his house, a total of $48. For a full long-distance metallic circuit in his store he would only have to pay the Fayette $30 and for a long-distance metallic circuit in his home $18. So with us he would get for $48 a full metallic circuit for what he would have to pay the Bell Company for a grounded circuit. For the metallic circuit he would have to pay the Bell people $96, just twice what he would have to pay us for a better service."

"Will you cut rates?" was asked.

"No, by no means. When we went into this we investigated the matter, examined the business of other companies and fixed our rates at what are fair living rates for first-class service—for a full metallic system with the latest improved switchboard and instruments. We promised the council and the people to give a first-class service for those prices. It has already been demonstrated to us that the people will be with us, for they, of course, realize that if the Bell can freeze us out they will be in the power of the same old monopoly that has charged double rates for poor service. I would be glad to see every man in town put in one of the Bell 'phones and get used to using a 'phone — try their service, for I know we will get every man who wants a telephone as soon as we start and the difference in the service they give and we give can be tested."

During the conversation one of the

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leading business men of the town came into the office and said:

"I want to subscribe for one of your telephones for my office and house. I have never had a telephone at home, but I want one of yours. If the East Tennessee can afford to cut their rates in two they must have gotten hundreds of thousands of dollars out of this town over and above a fair profit. If they can't afford to cut I am not willing to see them ruin a home company, owned by Lexington men, men who live here, spend their money here and take the risk of fighting a great monopoly, for if they succeed they will again be able to charge double rates. If this is going to be a fight like that I am on the side of home men—I'm with John Shelby, Colonel Breckinridge, Desha Breckinridge, Frank Bullock and John Allen against a company that first charges too high for cheap service and then uses that money to try and kill a home company that it may continue to do the same thing. If you want me to do it I'll go out and canvass for new subscribers for you, and I'll bet $1,000 you have more subscribers to start with than the old company has, even if it gives its telephones away."

BELL COMPETITION IN THE EAST.

The Diamond State Telephone Company and the Eastern Shore Telegraph & Telephone Company, the former with headquarters at Dover and the latter with headquarters at this place, both lines being controlled by Mr. Harry A. Richardson, of Dover, it is stated on good authority, will soon be confronted by a rival for peninsula business. A company called the Maryland and Delaware Telephone Company has been chartered within the past few days under the laws of Delaware. The new organization is backed by a number of well-known Baltimore capitalists, who propose to absorb at once 120 miles of lines built by the Queen Anne's Railroad Company about three years ago, nearly all of which are now in use. These lines have in some instances been neglected, as they were not specially needed by the railroad officials for the business of the line, but they may be easily made a part of a valuable system. It is proposed to build a number of additional lines or connections to join the main line now in use from Queenstown to Rehoboth, and to points north. The Queen Anne's Railroad Company owns telephone franchises in Rehoboth, Lewes, Denton, Federalsburg, Greensboro, Ridgley, Queenstown, Centerville and other places, and these franchises allow the building of regular exchange systems. The new lines will have first-class connection via Wilmington and the Maryland Telephone Company, of Baltimore City.

VALUATION OF MICHIGAN EXCHANGES.

Prof. M. E. Cooley has presented to the tax commission a detailed report of the property holdings of the different telephone companies operating in the State of Michigan and the valuations, complete, of the various companies and plants. The report was prepared by Chief Telephone Inspector W. J. Rice, of New York, an experienced telephone man, assisted by eleven experts. The recapitulation is as follows:

Total number of companies reported by auditor general, 1899, 64.
Found to have gone out of existence or consolidated with other companies, 20.
Additional companies found by field inspectors, 20.
Total valuation of companies reported by this appraisal, 64.
Total valuation (including real estate), $6,339,840.06.
Total valuation reported in 1899, $2,271,343.24.
Increase, $4,068,497.72.
Valuation of the twenty companies found by inspectors, $142,762.17.
Actual increased valuation, $3,925,735.55.
Total number of exchanges, 282.
Total number of poles, 335,068.
Total number of cross-arms, 400,993.
Total number of subscribers, 66,744.
Total mileage of pole lines, 11,169.
Total mileage of wire, 71,527.

THE article Mr. Clausen had in preparation for February contained so many diagrams, together with the reading matter, that it was impossible for him to complete it in time for this issue, but it will appear in the March number together with his March article.

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TALKS AND CROSS-TALKS.

BY A. E. DOBBS.

HINTS TO CORRESPONDENTS.

Write on one side of the paper only, and make sketch or diagram, when necessary. Endeavor to give all the facts bearing on the case, so as to enable the editor to answer intelligently.

Name and address must accompany each letter, not for publication, but for the information of the publisher.

MORE ABOUT CENTRAL BATTERY SYSTEMS.

I am glad to see our friend Clausen take the stand he has in regard to central signaling as against full central energy systems. In directness, simplicity and efficiency, the self-contained magneto system has never yet been excelled, and central energy men admit as much when, in talking up sales, they make the claim that their apparatus will "talk as well as a magneto instrument." This is accomplished by the use of a very powerful transmitter and receiver, the loudness of which is modified by the use of choke coils, repeating coils or condensers, or a combination of all three. This generally gives a good local talking service, but very poor outside service, and toll stations must be installed as a separate feature. But still the self-contained instrument will not ring off when the receiver is hung up, which impedes the service, and as rapidity of service is the watchword these days, automatic supervision in some form is here to stay.

In Fig. 9 is shown one of Scribner's latest circuits, which will repay study. In the circuit at the subscriber's station is the ringer and condenser which leaves the line open to the ordinary battery current, but will allow the bells to be rung by an alternating current thru the

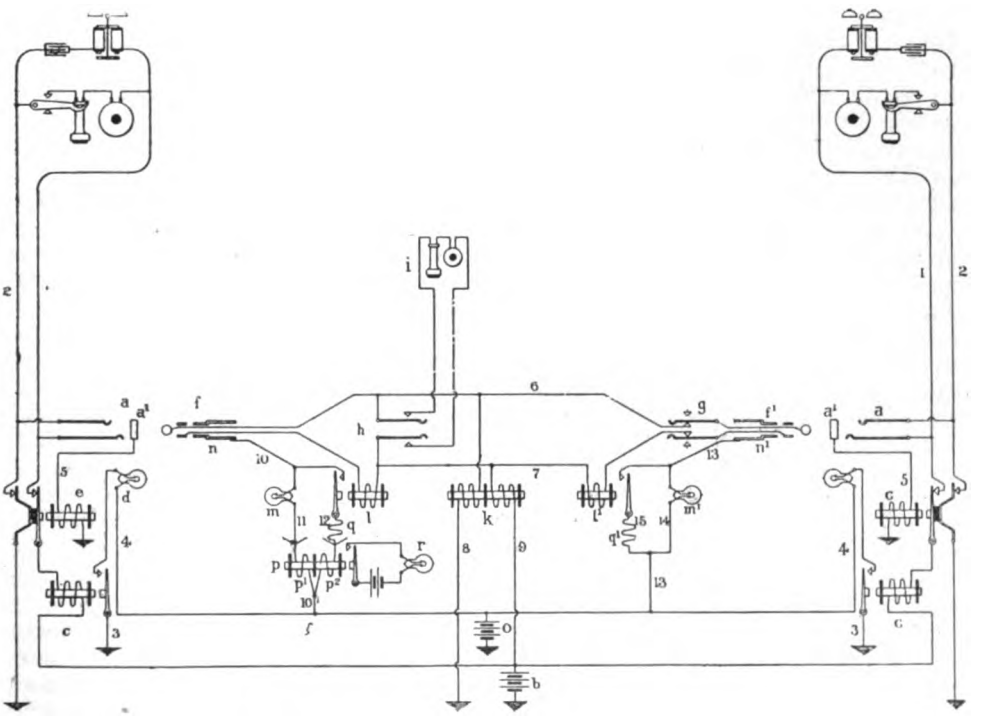

FIG. 9.

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condenser. Of course this condenser can be omitted and the ringers wound to very high resistance, which is sometimes done. With a condenser, however, the ringer need not be wound to a higher resistance than 100 ohms, while without it the ringers would need to be wound to at least 2,500 ohms and probably higher, and even then the leakage on a large system would be considerable, while with condensers there would be no loss of current at all, or at least so little as not to be missed.

Following the circuit back toward the exchange we trace No. 1 wire thru the contacts of the relay *e*, thru the relay *c*, and thence to its connection with the battery *b*, one side of which goes to ground.

The No. 2 wire also passes thru the *e* relay contacts and grounds in the exchange. Now you see the battery *b* would pull up the *c* relay contact and light the lamp *d*, but for the fact that the line is opened by the condenser at the subscriber's instrument.

When the subscriber lifts his receiver off the hook the line is closed, and as the relay *c* is waiting for just such a chance as that, it immediately draws up its armature and lights the lamp *d*, thru the circuit 4, which gets its current from another battery *o*. The lighting of the lamp *d* is a notice to the operator that there is either a cross in the line or a subscriber calling in.

We will now leave this portion of the circuit for the time being and study the cord circuit. The plugs *f f'* are made in three parts, there being the usual tip and sleeve connections to line made thru an open jack. It may also be remarked right here that the left-hand plug is the answering, and the right-hand the calling plug. We know this from the fact that we observe on the right, at *g*, a push-button intended for connection to the generator, which is, however, not shown. The third connection on these plugs connects with a local circuit which starts at the battery *o*, follows the line 13, lamp *m* (right-hand side), plug *n'*, plug seat *a'*, line 5, relay *c*, and ground. Now it will be seen that this puts a current thru relay *c*, which of course must pull its armature forward and open the line at its contacts which, it will be seen, removes the ground and makes the line a complete metallic circuit.

Thus following up the operation so far, we get the following action: first, by removing his receiver from the hook the subscriber actuates the relay *c* (left-hand side), and lights the lamp *d*, which, let us say, is a white lamp. Then the operator plugs in (key *h*, telephone *i*), which actuates the relay *e*, and opens the line behind it, putting out the lamp *d*. The lamp *m* would now light up but for the fact that the subscriber is listening and keeps the line closed, which operates the relay *l*, and throws a shunt around the lamp *m*. The operator, in ringing out (right-hand plug), pushes the cam *g*, and rings the desired number. As the subscriber called is not at his telephone, the line is open to the battery *b*, which, it will be observed, goes thru the neutral coil *k*, and back to ground, having tapped the cord circuit 6, 7. Consequently, the relay *l'*, not being acted upon, the lamp *m'* remains lighted till the called subscriber answers, when the relay *l'* acts and throws a shunt around the lamp and puts it out.

In the right-hand corner will also be seen another lamp *r*, connected thru a differential coil p^1, p^2, which is not a necessary part of the system, tho quite convenient. As long as the lamp *m* is cut out by the shunt 12, the circuit thru the lamp *r* will not be closed, as the two windings oppose each other. Should the shunt 12, however, open up, as it would do when a subscriber hung up his receiver, the coil *p*, being open, would allow the coil *p'* to act, pull the armature forward and close the lamp *r*. This lamp is generally intended as a pilot lamp and connects to the chief operator's desk or on the upper part of the switchboard. It can be so connected that all the cords can be connected to one lamp or a separate lamp for each cord circuit. Its object is to enable the chief operator to watch the girls and keep them up to their work.

These lamps are generally of different colors, so as to be easily distinguished; thus, the line lamps *d* are white, the supervisory lamps *m*, *m'*, red, and the pilot lamp *r* blue or green, which enables the

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chief operator or monitor to tell at a glance the exact condition of each board, and if she should see a lamp lighted longer than necessary, an investigation would follow.

By reading the Patent Digest each month the reader will find many interesting systems, and while, perhaps, six months behind actual practice, yet they enable one to keep fairly well up to date.

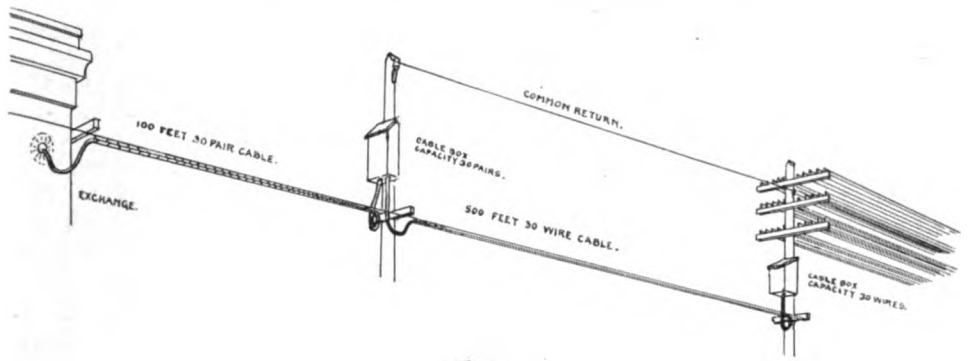

FIG. 1.

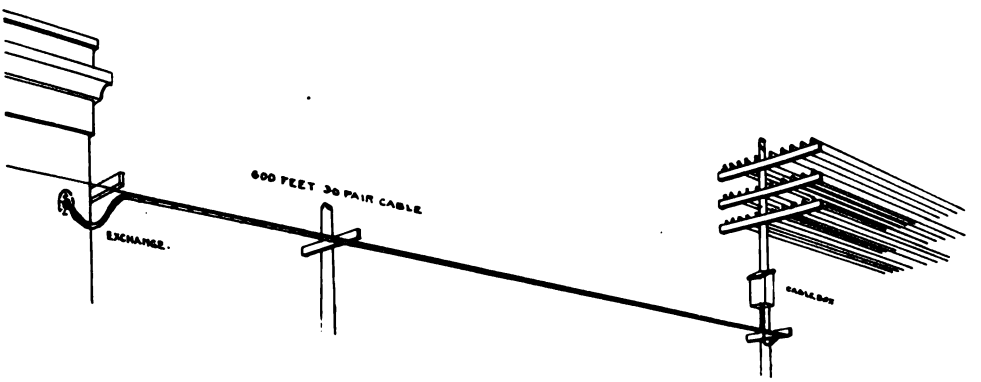

FIG. 2.

SINGLE OR METALLIC CABLES?

71. (1) In the above sketches (Figs. 1 and 2), which of the two methods there shown will give the more satisfactory results?

(2) Is there any decided difference so far as induction is concerned between rubber and paper cables?

(3) Will a large common-return wire in sketch 1 also assist in removing cross-talk?

(1) The difference in the two sketches lies in the cable, which in the first case is a single-wire cable of thirty wires, while the second consists of thirty paired circuits or sixty wires. This also makes a difference of 500 feet in the length of the common-return wire, which, in the first case comes back as far as the pole A, while in the second it stops off and connects to one side of each pair at the pole B. The metallic circuit plan in Fig. 2 will give the better service.

(2) Theoretically a rubber cable has from three to five times the induction of a paper cable.

(3) Within certain limits a large common return is better than a small one. Any size larger than No. 10 would, however, be unnecessary for thirty wires and would make no perceptible difference in the amount of cross-talk.

ANSWER TO QUESTION 66.

72. In answer to No. 66.— Clean the carbon arresters on the protector mount, and if that does not remove the trouble, reverse the cable wires on the protector mount on the board side.

The trouble is, the subscriber's line is connected to the "ground" side of the terminal in the exchange, or the "ground" side of the cable pair is connected to the "line" at the cable box, which changing sides will remedy.

G. P. SCHLOSSER.

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INTERIOR TELEPHONE REPAIRING.

73. I have two interior telephones made by the ——— and can not get them to work.

The Inspector never heard of the instrument you mention, but he would first rip out all the old wiring and do it over again and test each part as he went along. It is not at all improbable that the receiver has become "played out" by losing its magnetism, and this should first be tested by putting it in circuit with a battery, leaving the cord on in order to test it at the same time. If you do not get a distinct "click" in the ear you have an open circuit, either in the receiver or the cord. To test this, make a wire connection directly to the binding posts of the receiver, and if you then get a "click" you know that there is a broken cord.

You can judge by the strength of this "click" whether the receiver possesses any magnet strength. You can also tell this by the "pull" on the diaphragm.

Next test your induction coils by connecting as shown in Fig. 3. Connect

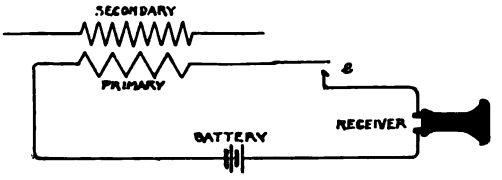

FIG. 3.

one end of the coil thru the battery and a receiver as shown, and find the other end by searching for it with the free end *e*, and a closed circuit will be indicated by the usual "click" in the telephone receiver. If you can not get this "click" the coil is open. Having found the two wires belonging to one coil you know that the other two must belong to the other coil, but test it anyhow to make sure the coil is all right.

Now proceed to take one end of the primary and one end of the secondary windings and test them also thru the 'phone to see whether the circuit is open or closed. If open the circuit is all right; if closed there is a cross in the two windings, and the coil must be rewound or thrown aside.

If in doubt as to which is the primary and which the secondary, try both primary and secondary with the battery and receiver and note the difference in

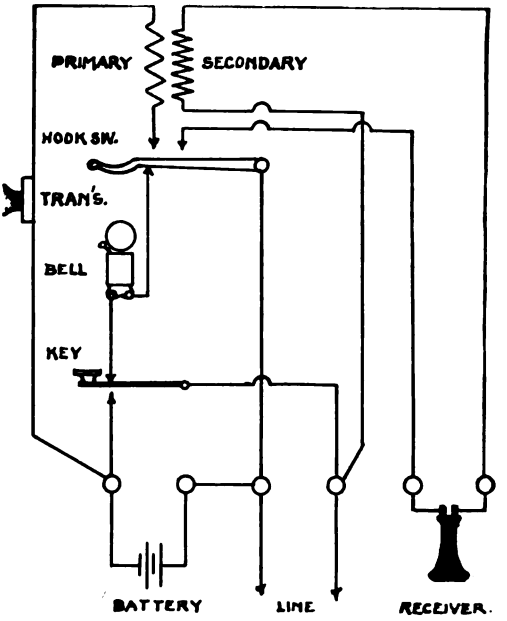

FIG. 4.

the click. The primary coil will generally give the stronger "click."

Test thru transmitter also and if all right proceed to connect as shown in Fig. 4.

CROSS-TALK VS. ELECTRIC LIGHT.

74. We have cross-talk on two lines running alongside of each other for about three miles on one end of an electric-light arm. Could I not help matters by putting one on each end of the arm, which makes the distance between them about three feet?

You would get less cross-talk, but probably more electric-light induction.

AN OLD QUESTION.

75. Can you tell me the difference between a series and a bridged ringer, and also whether a bridged ringer will give as good satisfaction on a series line as a series instrument?

This question has been answered several times before, but new readers are all the time coming in and for their benefit we give it again.

When bells are to be connected in series, it is desirable to have the resist-

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ance of the ringers as low as possible in order that the resistance of the line of which they are a part should also be as low as possible. The magnets are made as short as practicable in order to avoid the retardation of the iron core, which increases with its length.

With a bridging ringer the case is reversed, each ringer being in multiple, which makes to that extent a leak to the other side of the circuit, which may be another wire or a ground, as the case may be.

Therefore, we make the resistance of these as high as practicable in order to have a small amount of leakage and we also make the magnet cores longer to choke back the voice currents and keep them on the line, except for the two instruments in use, the instruments in use having low-wound induction

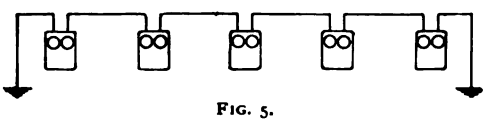

FIG. 5.

coils, with comparatively little self-induction, receive the larger part of the current as they should.

As to your second query: If several bridging 'phones were placed in series they would not give good ringing effects on account of their high resistance. For the same reason conversation thru one 1,000-ohm ringer is hardly

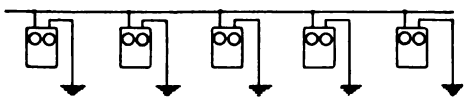

FIG. 6.

possible, and thru several ringers it would be impossible. The difference in connecting the two classes is shown in Figs. 5 and 6.

The following table approximates the practice of one well-known manufacturer in the matter of windings:

Resistance.	Size of wire.	No. of turns.
80 ohms.....	31	2 000
500 "	36	3,700
1,000 "	36	7 000

DUPLEXING CIRCUITS.

76. Can you tell me whether the plan shown in Fig. 7, for making three lines out of two metallic circuits is practical, and if so why not also connect the outside wires the same way, thus making four circuits?

Yes, the plan is practicable, tho having a tendency to throw the two lines out of balance and increase the cross-talk between them.

The plan shown in the dotted lines which I have added to the figure is better, as the balance of the lines in this

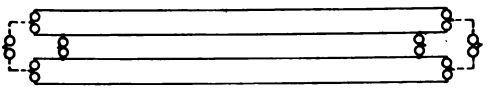

FIG. 7.

way is preserved, and as the current splits from the middle of the coils out, there is no retardation of the coils to affect the conversation.

As to your second question I will say that, as a connection to the outside would connect the lines together in closed circuit thru the ringers, there would be interference of signals as well as cross-talk to contend with. The only object in connecting in the manner shown is to avoid this.

UP TO OUR READERS.

77. I have four Edison Lalande batteries used in connection with a phonograph about one hour out of the twenty-four and the balance of the time it remains idle.

In order to prevent deterioration on open circuit I use a shunt of about 110 ohms resistance. Now I should like to know if this is the most economical resistance to use?

Some electricians claim that while the cells are idle the resistance should be high enough to overcome the tendency of the solution to reoxidize the reduced copper surface of the plates. Now what amount of current will suffice to prevent this?

If the Inspector should be located in a small town he would solve this question by actual experiment by grouping incandescent lamps as resistances.

For example, a 110-volt lamp has a resistance, when cold, of about 400 ohms. By connecting two in multiple you would get a resistance of 200 ohms, while two in series would give between 800 and 900 ohms. By combining them in this way and observing the effect

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you will soon find the right resistance yourself.

Have any of our readers made any experiments along this line?

FARMERS' LINES.

78. Suppose I build a farmers' line, say ten miles long, of No. 12 BB wire, is there any way I can place, say, six subscribers on one side and six on the other so that in ringing to ground only the six bells on one side will ring, making it to that extent selective signaling; or so that only half the bells will ring at one time; the talking circuit to be metallic?

Is this practical?

Yes, but I would advise you to send to your manufacturer, state the case to him and let him wire the apparatus for you.

First: Disconnect the ringer from the switch hook and have it permanently grounded.

Second: Connect an extra spring to your generator so that when your shaft pushes in it will also make a ground contact.

Third: Have a double spring (double pole) jack, each side of which is

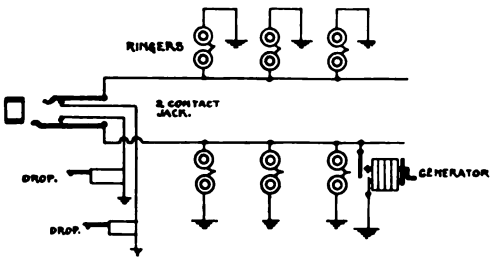

FIG. 8.

connected to two different grounded drops, which, of course, are cut out when the plug is inserted.

Fourth: Have two cams reversed, so that the "ground" comes on the "tip" of one and the "sleeve" of the other.

The arrangement of the circuit is shown in Fig. 8.

A NOISY CIRCUIT.

70. We have a line from G—— to C——, a distance of twenty-five miles, with an electric light plant at each end. At night we have so much induction from the electric light circuits that conversation is almost impossible. I went outside of the town the other night and opened the line, and on testing both ways the line was quiet, but as soon as connected together the noise returned again. The line is metallic circuit, transposed every sixteenth pole.

Look your line over and see if it is free from "grounds," and when in the vicinity of the electric light circuits transpose oftener, say every fourth pole. A line running thru trees, where an electric light wire passes, will also make a noisy line from leakage thru the limbs or foliage, unless kept "clear." A bad joint in one of the wires will also tend to unbalance the circuit and make a line noisy, tho that would also be apparent in the daytime, but if there was much inductive disturbance it would also make it so much the worse and more noticeable.

CINCINNATI INCREASE.

Since July 1 the increase of subscribers of the Independent Telephone Company, at Cincinnati, has been 2,018. This is the largest development that the company has shown in any one period and exceeds the increase of any company in the West.

DOING BUSINESS.

Manager H. H. Stewart, of the Peoples' Telephone Company, of Superior, Wisconsin, writes that he has increased by nearly 1,000 calls during the past two months. The following interesting table shows one day's business:

Local calls	7,059
From Duluth	646
To Duluth	858
From East End	327
To East End	388
From West Duluth	17
To West Duluth	22
Total	9,297

The East End office answered a total of 1,018 calls.

In his New Year's greeting to the people of Superior, Manager Stewart also comments on the fact that the company now has 750 subscribers, and connection with 1,400 more, by way of Duluth.

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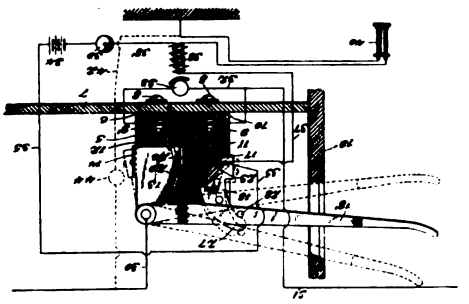
MONTHLY DIGEST OF TELEPHONE AND KINDRED PATENTS

EDITED BY EDWARD E. CLEMENT.

Copies may be had, postage paid, by enclosing 10 cents for each one. Address inquiries in care of this magazine or to McGill building, Washington, D. C.

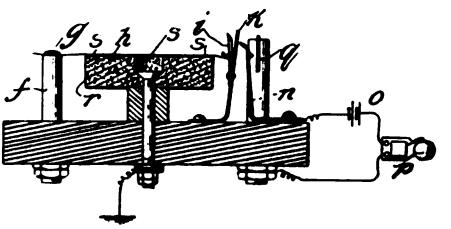
No. 662,543.—L. M. NEHER. TELEPHONE SWITCH.

This is a switch hook for party lines, where the line is to be used one way only at any time. The hook has three positions. When it is down the local ringer is connected; when it is half-way up the talking set is connected one way to line, and when all the way up, the talking set is connected the other way to line. The construction is shown clearly in the accompanying figure. The hook



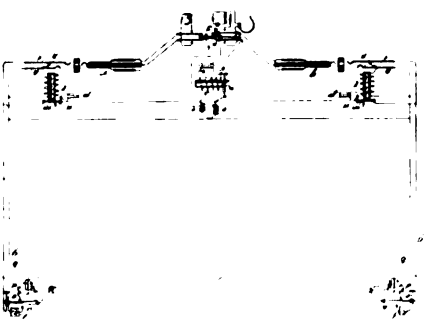
662,543. TELEPHONE SWITCH.

lever 18′ is shown in solid lines in the half-way position and in dotted lines in the other two positions. There are two movable pivoted dogs, 13 and 18, the former, 13, normally making contact with spring 12, connected to the ringer 33, and the latter, 18, normally touching nothing, its two insulated springs, 24-25, resting in the position shown. This is with the hook down, and the circuit is from wire 31 to wire 32, ringer 33, post 9′, spring 12, dog 13, and to line 30. With the hook half-way up, the circuit is from wire 30 to hook lever and dog 13, to spring 26, wire 37 to secondary of induction coil 38, to receiver 40, and ground, the primary circuit 35, 39, 38′ being closed at the same time thru the twin spring 25. When the hook is all the way up a pin 28 on the lever strikes dog 27 and turns it to bring springs 25-26 against spring 11, leaving dog 13, and completing the circuit from wire 31, to post 9, spring 11, spring 26, wire 37 to secondary of induction coil 38, to receiver 40 and ground. The local is also closed simultaneously. The dog 13 has a shoulder stop that strikes frame 5 and holds it as shown in full lines, and up to that point it moves the hook lever, a spring on the other side of the frame impelling it, but after that the hook lever is moved the rest of the way by hand.



No. 662,987.—A. STROMBERG. CIRCUIT PROTECTOR.

This is a combined "lightning arrester" or spark gap, and fusible cut-out. It consists of block *v* of carbon, grounded, with line fuses *h* held under tension by springs *k* across the face of the carbon block resting on bridge strips *s s s* of mica. If a fuse blows, the spring will close the local circuit and give alarm.



No. 662,988.—A. STROMBERG AND W. M. DAVIS TELEPHONE EXCHANGE SYSTEM.

This is an adaptation of a well-known idea to clearing-out signals. The clearing out relay *s* is bridged from one main battery bus (connected to one side

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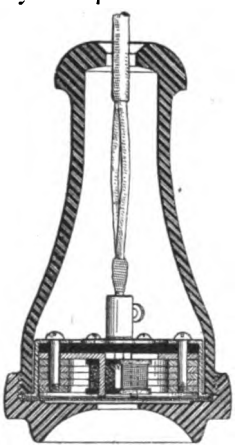
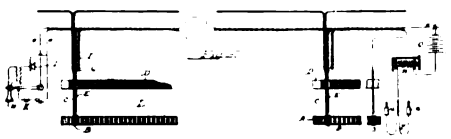
of all lines) to one side of all cords. When the armature is pulled up, on the subscriber working his magneto, a lamp circuit is closed which includes a battery *o* and the windings of the relay s, in parallel with the line path, both connections with the cord circuit being thru the listening key, with the result that the lamp is lighted and the magnet holds up its armature to keep it lighted, until the listening key is depressed.



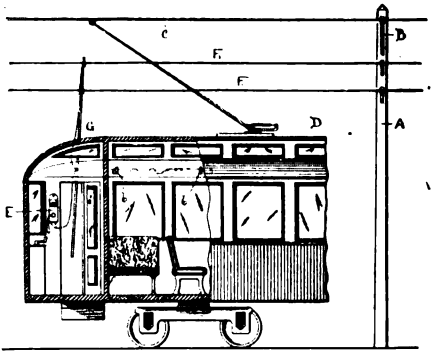
No. 663,196.— C. H. NORTH. TELEPHONE RECEIVER.

This is a form of receiver which has been quite generally sold for some time, the patent having been held up by interference proceedings in the patent office, hence the delay in its issue. Having won the interference, Mr. North covers the feature of a flanged support, as C, for the magnet structure and windings, held in place and clamped between the cap and shell. The diaphragm lies on the flange of the support, and the cap clamps it firmly down.



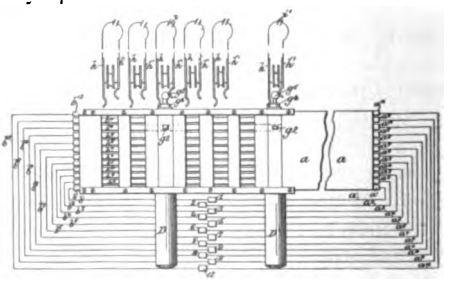
No. 662,986.—A. STROMBERG. TELEPHONE EXCHANGE SYSTEM AND APPARATUS.

This is a multiple switchboard designed to have the jacks one-fourth inch apart between centers and to have a single conductor cord. The system used is centry energy, a common battery O being employed. Subscribers' lines come into the exchange as metallic lines, and these at once become common return, one side of each line being hitched directly onto the bus N of the battery. The other side of each line goes to a spring in its jack, the jack being thus really a "one spring" jack, or "one contact" jack of the primitive type. Pin plugs are used, having each a single contact, and the single conductor cord has its middle point connected thru a clearing-out signal winding to the battery. A thimble is provided in each jack for test purposes only, all the thimbles of one line being wired together.



No. 663,216.— E. E. CARPENTER. RAILWAY TELEPHONE SYSTEM.

This is a scheme for use on electric railways particularly. A telephone E is mounted in the car, and a jointed pole G enables the user to reach out thru a door in the side of the car and press a couple of spring plates against a pair of bare wires F F running parallel to the track. The one claim is necessarily very specific in its terms.



No. 663,367.— C. SHORE AND C. HEAP. SWITCHBOARD FOR TELEPHONIC OR TELEGRAPHIC PURPOSES.

This is a cordless board. Instead of cords, a series of insulated strips (b^1 to

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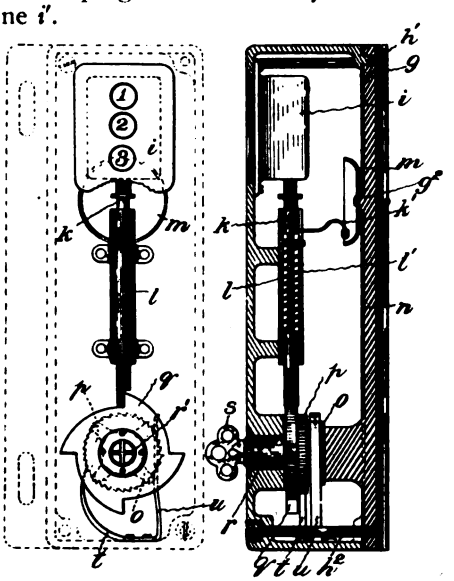
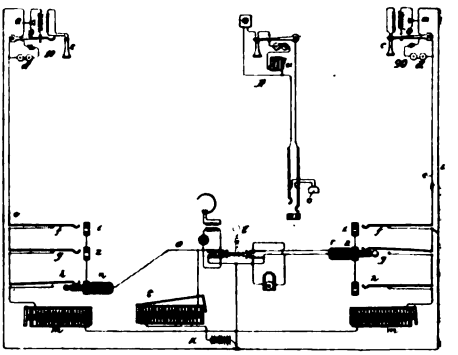
b^{12}) are provided in horizontal rows, the rows being piled up in a bank. Plugs D D′ have insulating shanks carrying contacts positioned on the shanks so that any given pair of plugs will have their contacts register with the same strips when the plugs are inserted thru apertures left in the banks. Back of each aperture is a line jack shown at *h h′* in the figure, and each plug has a sleeve and tip connected respectively to its two contacts and fitted to take into the jack back of any aperture. To connect the subscribers *i* and *i′* in the figure, plugs D and D′ are inserted, when their contacts g^2, g^2 engage with strips b^{10}, a^{10} and their tips g^5 and sleeves g^4 with springs *h h′* of the jacks, respectively, the circuit being from jack *h h′* of line *i* to strips a^{10}, b^{10}, thru the first plug D, then to plug D′, and so to jack *h h′* of line *i′*.



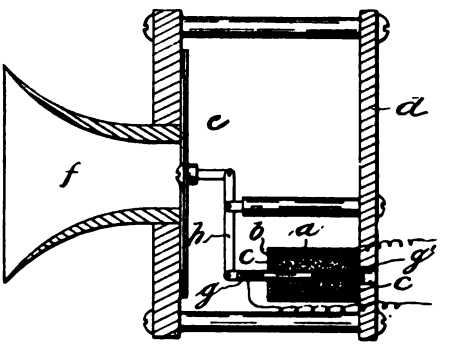
No. 664,346.—W. H. BARKER. TELEPHONE CALL REGISTER.

This is a key register for attachment to pay station or measured service 'phones. A metal box *h* has a flange on the left to attach it over the flange of a transmitter-arm base, and contains within it a register *i*, a bell *m*, a key barrel *r* and a connecting rod *k*. The register *i* has dials with geared hands, initially moved step by step by a reciprocation of the rod *k*, which extends up into the register case. The rod is moved by a four-toothed cam wheel *q*, which is turned by the key *s* inserted when a call is made, instead of dropping a coin. As the key turns, the rod *k* is raised and works the register to record the call, while at the same time a hammer-head *k′* carried by the rod strikes the bell *m*, whose tones are carried by the resonance of the case to the transmitter, and apprise the listening operator at central that the registry is accomplished.



No. 662,984.—A. STROMBERG. TELEPHONE EXCHANGE SYSTEM.

The claims in this case are specific and the invention is hard to define. The system has metallic outside lines, but in the central office is an ordinary common return, with single conductor cord and "pin plugs" to connect the lines, a common battery bridged from each cord to the common return, and with a clearing-out signal in the bridge. Line signals are cut out when plugs are inserted.



No. 662,985.—A. STROMBERG. TELEPHONE TRANSMITTER.

This is an evasion of the claims of the Berliner patent covering contact telephones. It consists essentially of a piston rod *g* reciprocated by the movements

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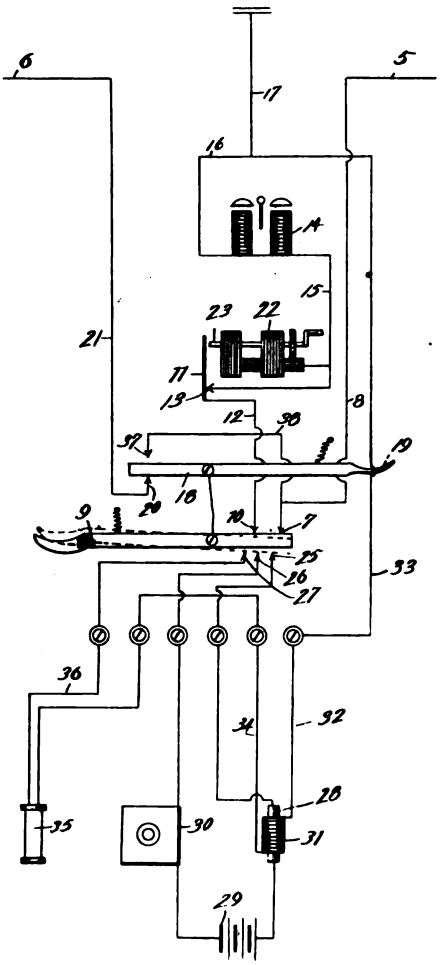
of a diaphragm *e* thru a cylindrical chamber *a* containing carbon granules *b*. The rod moves thru holes in the ends of the cylinder; where it is surrounded by plush rings to keep in the granules. The exposure of more or less of its surface to the carbon is supposed to effect the necessary changes in resistances without agitating the granules.

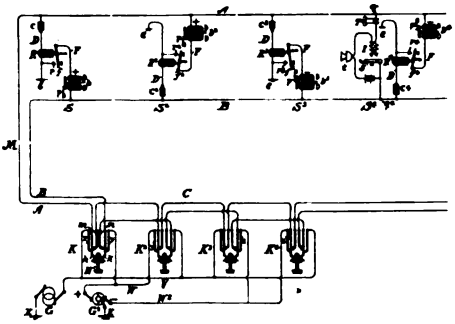


No. 663,412.—W. W. BENNETT. TELEPHONE SYSTEM.

This is an arrangement of a subscriber's station for party lines, so as to be able to cut off the line on either side of the instrument, to talk over the other side, the ringer being normally connected to both sides.

In the diagram, 14 is the ringer, in a ground tap 17-15 connected by wire 12 to hook contact 10, and hook 9 to lever 18, and line wire 20, 21, 6; also from contact 10 to contact 7, and so to line wire 8, 5.

If it is desired to talk, the receiver is taken down and hook 9 rising closes local circuit 25, 26, 29 and secondary circuit 17, 33, 32, 31, 34, 35, 36, 27 to hook 9 and to lever 18. With lever 18 down as shown, the talk is over line 20, 21, 6. If the finger be placed on the hook 19 to hold it down and tilt lever 18, the circuit will be from lever 18 to contact 37, wires 38, 8 and 5.



No. 663,783.— F. A. PICKERNELL. SELECTIVE SIGNAL SYSTEM.

This is a selective party-line system, of the type originated by Messrs. Whittemore, Barrett and Gaft, but is particularly adapted for common-battery systems, where no bridge of the lines except the telephone bridge can be permitted.

At the central station C two generators are employed, one, G, supplying alternating current, and the other, G^2, having a commutator which serves to give out intermittent current of either sign. These two generators are grounded on one side and connected to the selective ringing keys on the other. Each key has the alternating generator connection on one side and the plus or minus intermittent on the other, so that all necessary combinations are made.

At each substation there is a branch containing a condenser, and leading thru a relay winding, R, R^2, R^3 or R^4 to ground. At the second and fourth stations this branch is connected to the line wire B, while at the first and third stations it is from the line wire A. Each relay, when energized, is adapted to

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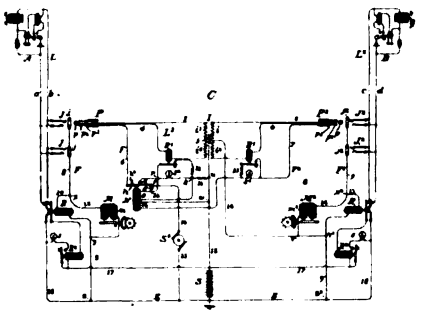
close a second ground branch from the other line wire than that to which it is itself connected, thru the station ringer b, b^2, b^3 or b^4. The ringers are made so that they will respond each to a current of one direction only and of intermittent character.

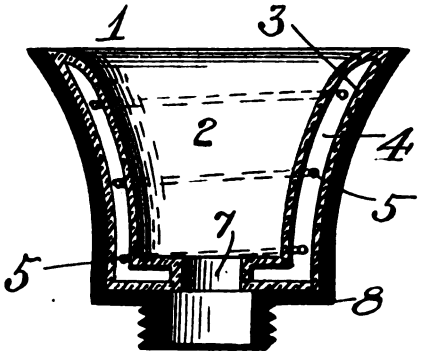
To call a particular station, as station S^4, alternating current is put on line wire B by means of key K^4, which also puts the intermittent current of minus sign on line wire A simultaneously. The current flowing over wire B goes to ground at both stations S^2 and S^4, thru relays R^2 and R^4, both of which attract their armatures, connecting the ringers b^2 and b^4 from line wire A to ground at contacts r^2 and r^4. The ringer b^2, however, will only respond to intermittent plus current, and ringer b^4 to intermittent minus current. As minus current is on the line, the latter responds, as intended.



No. 664,191.— G. K. THOMPSON. CALL REGISTER OR SERVICE METER CIRCUIT FOR SWITCHBOARD APPARATUS.

This invention concerns automatic registers which are located at a central office and respond to changes produced during the usual manipulation of two circuits for connection. The system shown in the diagram is the well-known "relay type" employed in Bell exchanges, having a common battery S for both talking and signaling, line relays R^2, controlling lamps, and cut-off relays disconnecting the lines inside the spring jacks during a conversation. When the answering plug P is inserted in a jack, as J, a conductor F is brought into connection, thru the sleeve p^3 of the plug, and the thimble j of the jack, with the cut-off relay R, current then flowing from battery S thru the following path: 15, u, 31, k, o, 36 r, e, h, 6, (F), p^3, j, 8, x, 10, R, y, 8, z, E, to battery. This current energizes the relay R, but does not energize relay N, on which the winding o is placed. The register M is controlled by a single magnet m, included in a shunt 12, between points x and y around the cut-off relay, and therefore also receives its portion of current thru the circuit just traced, but not sufficient to energize it. When the calling plug P^2 is inserted in the wanted line jack J^2, however, these conditions are changed. The circuit F^2 of the calling plug (corresponding to that of F of the answering plug) includes a winding n on magnet N, and consequently the insertion of the calling plug adds the effect of coil n to that of coil o on magnet N, which suffices to pull over the armature h from contact e to contact g, the end in its travel passing over an intermediate contact f, whereby a circuit is momentarily completed thru path F for strong current from generator S^2. This suffices to operate the register M.

If plug P^2 should afterward be withdrawn, as in case of a mistake, no further operation of the register will take place, for the reason that coil o, while insufficient to draw down the armature h, is sufficient to hold it down until circuit F is finally broken by the withdrawal of plug P.



No. 663,995.— L. L. LACY. GERM DESTROYER FOR TELEPHONE MOUTHPIECES.

This is a mouthpiece made with an incandescent electric light in it, the idea being to destroy germs that lodge in the mouthpiece by the light. In the figure 1 is a glass mouthpiece molded hollow, with a filament 5 in the cavity 4, and

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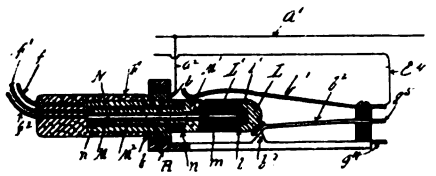
suitable leading-in wires, whereby a battery or other source of current supply may be connected.

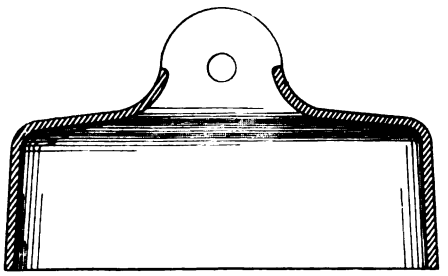
No. 663,510.—W. S. PACA. TELEPHONE SWITCHBOARD.

This invention covers new means for testing lines on multiple switchboards. Each jack has a thimble or spool of magnetic metal, wound with a coil, and when a plug is inserted in any jack of a line the corresponding thimbles all over the board become magnetized, their coils receiving current as long as the plug remains inserted. To test, the operator touches the iron plug tip to the iron thimble, and if it sticks, the line is busy.



No. 663,511.—W. S. PACA. TELEPHONE SWITCHBOARD APPARATUS.

This is a test for multiple boards similar to that of the same inventor above referred to, but in the present case a coil is placed on each plug and connected on one side to the tip of the plug, and on the other to the main battery thru a cord conductor. Each jack has a test thimble connected to all other test thimbles, as usual, of the line, and when a plug is touched to a busy jack, current flows from the thimble thru the plug coil to magnetize the plug and cause it to stick to the thimble, both being iron.



No. 33,640 (Design).—W. J. BARR. TELEPHONE TRANSMITTER ARM BASE.

MULTIPLE SWITCHBOARD.

A full multiple switchboard, without a lot of complicated auxiliary apparatus, affords telephone companies an opportunity to reduce maintenance to a minimum and thereby increase their earning capacity. The Swedish-American Telephone Company has recently secured additional manufacturing facilities and also doubled its floor space, and is now prepared to furnish full exchange equipment, either the magneto ring-down type or full multiple and central-energy switchboards, from a ten-line to a ten-thousand-line exchange.

Concerning our full multiple central-energy switchboards, will say that all signals, both line and keyboard signals, on this switchboard are of the luminous type, consisting of a miniature incandescent lamp placed behind a ⅜-inch opal glass bull's-eye. They are, of course, self-restoring in action. As is well known, this form of signal is the most positive ever devised and can not fail to attract the attention of the operator. It has also the advantage of being extremely compact and including no movable parts of any sort. This permits the most advantageous arrangement of drops and line jacks, namely, the placing of the answering jack directly underneath its line signal. Thus the operator in answering a call is not obliged to find the jack corresponding to the signal shown, but she has simply to plug into the jack directly under the lighted signal. It is thus practically impossible to make a mistake in answering a call. This arrangement, of course, allows any amount of cross-connecting or distributing of the subscribers' lines into any operator's position without any renumbering of drops or answering jacks.

The cord-circuit signals are of the same luminous type, and each pair of cords is equipped with two, the full supervisory system of signals. One of these signals, of course, works only in connection with the answering plug and the other works only in connection with the calling plug, thus enabling the operator at any instant to tell at a glance the exact state of the connection at that moment. This entirely does away with

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the necessity of the operator ever going into the circuit after the connection has once been made, and thus not only is the subscriber relieved from the annoyance of having conversation interrupted by the operator, but considerable of the operator's time is thus saved, which can, of course, be utilized in answering other calls more rapidly, thus increasing the speed of the board.

The keyboards are equipped with ringing key and operator's cam, or with combination key, which performs both operations. In this board the strips of drops and jacks are placed in the lower panels and above them are placed the multiple jacks. The multiple jacks are made in strips of twenty each, each jack being placed on 7-16 inch centers. Each jack consists of only sleeve and tip springs and are therefore entirely free from inside contacts, which are used in all other systems. As is well known, contacts in jacks are the source of endless trouble, due to dust and corrosion at the points of contact and where the common-battery system is used, and as this current is broken at these contacts, the liability of trouble is greatly increased. In fact, on this system there are no contacts anywhere in the subscriber's circuit, it being an absolutely continuous circuit from the subscriber's instrument to the jacks in the switchboard. The only contact in the entire circuit is that of the switch hook at the instrument and the contacts made between the plugs and the jack springs in the switchboard, but over the latter contacts no current is broken, as none of the common-battery current ever flows over the jacks or thru the cord circuit.

These switchboards, even in their smallest units, are true universal boards; that is, any board, no matter how small, can, if desired, be increased to a full multiple switchboard of any capacity simply by adding additional sections, and without any change in those installed, other than the addition of the multiple jacks and wiring of same.

The operation of this system is as follows: To signal the exchange, the receiver is taken from the hook, on which the line signal is at once lighted; when the operator answers by inserting the answering plug in the jack, this light at once goes out. On ascertaining the party required, the operator makes a busy test on the multiple jacks, and not finding the line busy, inserts the plug and rings the subscriber. At once the supervisory lamp of that cord circuit lights and remains lighted until the party called answers. When conversation is finished and both receivers are restored to their hooks, both lamps in the cord circuit are lighted. This condition of both lamps lighted being the only positive signal to the operator to disconnect, should one or both of the parties desire other connections when they have finished their conversation, the slow movement of the switch hook up and down will flash either one or both of the signals in the cord circuit, which will be a positive signal to the operator to connect herself at once with that circuit to find out what is wanted. In other words, thro the use of this double supervisory system, there can never be, as far as the operator is concerned, what might be termed a "position of doubt." Altho this switchboard and system accomplishes every action which is included in the most modern "Bell" switchboard, its chief advantage lies in the extreme simplicity of method and apparatus employed to effect it. Each line is equipped with a small relay and this relay controls all of the signals used in handling connections, whether those of the cord circuit or the line signal. Other than this relay there is no relay or coil of any sort used anywhere in the system, and the cord circuit is entirely free from them. All other central-energy systems have a large amount of auxiliary apparatus in the shape of relays and coils in the cord circuit in addition to the line relay.

This system is even more simple than the old-style magneto multiple-board system with local transmitter batteries. The busy test on this system is very novel and efficient and is applied by the subscriber himself and not by the operator when the call is answered. The instant the receiver is taken from the hook to signal the exchange the line will test busy. This, therefore, assures the sub-

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scriber the exclusive use of his line when he wishes it, there being no period of time, as in other systems, when his line is unprotected.

Another important feature of this system is the entire absence of the objectionable "click" in the receiver which is present in all other systems and is one of their worst features. This system is a true common-battery system, requiring but one set of storage batteries (of eleven cells) where all other systems require two sets, each of equal size. It is, in addition, a true two-wire system and requires no third wire, or what is its equivalent, a ground connection at each instrument.

What, after all, is the most important part of a common-battery system is its talking circuit. There is no system now in use which will furnish transmitter battery to instruments located farther than four miles from the source of energy. We will absolutely guarantee our system to give perfect results with the instruments located as far as thirty miles from the exchange, and at this distance they will work perfectly when connected at the switchboard, thru toll lines or to instruments working on the local battery, or any other common-battery system.

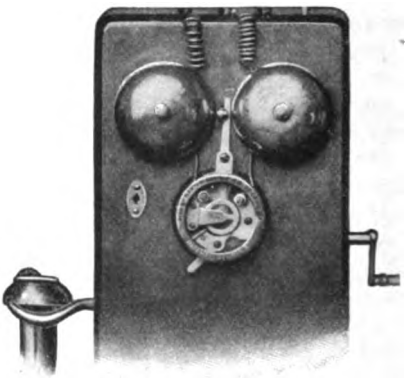
This apparatus is designed thruout, from the maintenance point of view, to give the most continuous service with the least attention. Different from other common-battery systems, it is so simple in its circuits and in its apparatus that it can be operated by any one familiar with the ordinary magneto local-battery system.

The Swedish-American Telephone Company will, on application, answer all inquiries concerning its apparatus, and invites correspondence.

A NEW EXTENSION CIRCUIT DEVICE.

A telephone extension signaling device without magnet coils of any description that does not insert any extra resistance in the circuit, and that resets itself after every signal, has been considered an ideal arrangement, but has never before been offered on the market.

The Garton-Daniels Company, of Keokuk, Iowa, makers of the well-known Garton lightning arresters for railway, light and power circuits, has recently brought out the device shown in the cuts herewith, which is known as the G.-D. Extension Circuit Ringer. In cut No. 1,001 the device is shown



No. 1001.

attached to the front of the magneto-box. Cut No. 1,002 gives a larger view of the device.

No. 1002.

It will be noted that a lever extending upward is held against the bell-clapper of the magneto. When the bell-clapper vibrates, the extension circuit is closed, reproducing the signal wherever the bell is located. As soon as the bell-clapper of the magneto comes to rest, the circuit is again opened automatically.

In the present forms of extension circuit-closing devices, a coil is depended upon to release a shutter, which closes the circuit when it falls. It is neces-

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sary to reset this shutter at once, or the battery will soon become exhausted. It very often occurs that a call comes when there is no one to answer, and the bell continues ringing until the battery is run down, a source of annoyance and expense. Then, too, lightning will throw the shutter, at night, when no one is around to reset same, and the battery becomes exhausted.

This trouble is obviated altogether by the use of the G.-D. Ringer, as it resets itself after each signal. This de-

No. 1003.

vice may also be used on party lines, where an ordinary drop would be of no value. The fact that the G.-D. Ringer cuts no resistance in the circuit, will appeal to practical telephone men, as

No. 1004.

this is a source of great annoyance with the present forms.

Cut No. 1,003 shows an ordinary drop-shutter circuit-closing device, now being placed on the market by the same company. This differs from present forms, in that it is not dependent on the action of a magnet, as in all other types now on the market. It is dependent on the motion of the bell-clapper of the magneto, the same as the ringer, but differs from the latter in that it must be reset after each signal. It is offered in competition with the present forms, but at a lower price.

In cut No. 1,004 this device, known as the G.-D. Extension Circuit Closer, is shown in position on the front of a magneto. These devices are described in pamphlet No. 26, which is sent on application to Garton-Daniels Company, Keokuk, Iowa.

TRADE NEWS.

THE clay-working and coal-mining interests of John T. McRoy, maker of the well-known "McRoy Conduits," situated at Brazil, Indiana, and which he has conducted for the past five years, have been incorporated as the McRoy Clay Works. "McRoy Conduits" will continue to be the principal product manufactured. Hereafter the headquarters of the company will be Brazil, Indiana, with branch offices in Chicago and New York.

THE Century Telephone Construction Company, of Cleveland, Ohio, reports a very large demand for its New Century telephone apparatus, particularly its New Century Long-Distance Solid Back Transmitter. It has under contract the construction of a 400-line exchange at Salamanca, New York, on which it will use its own apparatus. Also a $1,000-line exchange now under construction at Hornellsville, New York, and a contract for a 1,000-line exchange at Corning, New York, which was started January 15. These large exchanges will be fitted with multiple switchboards, electric light signals, central calling circuits with local battery for talking circuits, using the Century apparatus thruout. This firm keeps a large expert construction gang constantly in the field and takes contracts for building and equipping telephone exchanges complete, turning them over to owners in complete working order.

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RECENT PUBLICATIONS.

"In the type-case of the printer, all the wisdom of the world is contained, which has been or ever can be discovered. It is only requisite to know how the letters are to be arranged. So, also, in the hundreds of books and pamphlets which are every year published about ether, the structure of atoms, the theory of perception, as well as on the nature of the asthenic fever and carcinoma, all the most refined shades of possible hypotheses are exhausted, and among these there must necessarily be many fragments of the correct theory. But who knows how to find them?

"I insist upon this in order to make clear to you that all this literature, of untried and unconfirmed hypotheses, has no value in the progress of science. On the contrary, the few sound ideas which they may contain are concealed by the rubbish of the rest; and one who wants to publish something really new — FACTS — sees himself open to the danger of countless claims of priority, unless he is prepared to waste time and power in reading beforehand a quantity of absolutely useless books, and to destroy his readers' patience by a multitude of useless quotations."—HELMHOLTZ.

THE INSPECTOR AND THE TROUBLE MAN. Electrical Engineering Publishing Company, Chicago, U. S. A. 125 pages, fully illustrated; cloth; price, $1. Being the complete set of articles printed in the TELEPHONE MAGAZINE, under the title of "The Inspector and the Trouble Man."

The articles have been thoroly revised and brought fully up to date. The book takes in telephone construction, line construction, switchboard construction and operation together with their faults and how to remedy them. A complete volume, it is fully up to date, and a book that is recommended to every reader; is written in plain language and avoids all technicalities. The diagrams are clear and the explanation perfectly plain. This book undoubtedly fills what has been desired in telephony; a volume that can be read and clearly understood by the exchange manager, the exchange owner, operator, trouble man, lineman and inspector. It explains fully the working of the many different systems now in use by the Independent telephone exchanges thruout the United States.

THEORY AND CALCULATION OF ALTERNATE CURRENT PHENOMENA. By Chas. P. Steinmetz, with the assistance of Ernest J. Burg. Instantaneous Values and Integral Values. Law of Magnetic Induction. Graphic Representation. Symbolic Method. Topographic Method. Admittance, Conductance, Susceptance. Circuits containing Resistance, Inductance and Capacity. Resistance and Reactance of Transmission Lines. Effective Resistance and Reactance. Foucault or Eddy Currents. Power and Double Frequency Qualities in General. Distributed Capacity, Inductance, Resistance and Leakage. The Alternating Current Transformer. General Alternating Current Transformer or Frequency Converters. Induction Machines. Alternate Current Generator. Sychronizing Alternators. Synchronous Motor. Commutator Motors. Reaction Machines. Distorton of Wave Shape and its Causes. Effects of Higher Harmonics. Symbolic Representation of General Alternating Wave. Together with full description of all Alternating Current Laws, and general efficiency of Currents of a like nature. Third edition, revised and enlarged, 525 pages. Electrical World and Engineer Publishing Company. Price, $4.

PRACTICAL LESSONS IN METAL TURNING. A handbook for young engineers and amateur mechanics. By Percival Marshall. Illustrated. Boards. Price, 2s 6d ($1.50). Dawbarn & Ward. Limited, London. Electrical Engineering Publishing Company, Chicago, Illinois.

This book is not to be considered as a treatise on lathe work, but merely a volume for the amateur and beginner, and should be regarded as supplementary to the existing literature on the same subject. While it describes no original appliances, it is a valuable work for the reason that it shows a number of homemade appliances to work with the lathe, and its hints on screw-cutting are very good. It also devotes quite a little space to tools and tool-holders, measuring appliances, chucks and mandrels. Its descriptions and diagrams of homemade chucks are excellent and are written in a plain manner so that most any one could construct anything shown in the book. Its description of tool-making and tool-tempering is quite plain. It also devotes quite a lot of space and is illustrated in showing how to center work for the lathe, driving work between lathe centers, turning work between centers, chuck and face plate work, together with some very good advice and suggestions on drilling and boring in the lathe. It is a volume that was the writer's intention to make for amateurs, and he has fulfilled his mission.

PRACTICAL TELEPHONY. By James Bell and S. Wilson. Boards. 297 pages, 5 by 7 inches; illustrated. London: Electricity Publishing Company, 1899. Price, 75 cents.

"Practical Telephony" is made up largely of reprinted articles, originally published in *Electricity*. It is a work intended for technical schools and working electricians. While it does not pretend to be an advanced treatise on the broad subject of telephone practice, it is a tolerably complete guide to those who are pursuing such a course for the first time.

Of course, one does not find in a book like this much that is new, nor anything pertaining

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to the most approved American practice. The descriptions and illustrations given apply to the conventional English systems, which to the mind of an American are somewhat antiquated. The low price of the book, however, and its simple treatment of the ground covered by it, should commend it to those desiring an elementary exposition of the practice of telephony.

TELEPHONY. A Monthly Journal Devoted to the Interest of Independent Telephony. Illustrated. Chambers-McMeal Publishing Company.

It contains quite an interesting article for one thoroughly familiar with telephony in general, by Kempster B. Miller, and an article on wireless telephony by J. Kelsey. Also a very nice review of the telephone interest, by Herbert Law Webb. There are several good articles for the manufacturer by several well-known telephone men. While this number would interest a salesman, there is very little in it that would be of any value to an exchange owner or an employe.

A NEW TELEPHONE RECEIVER.

The Western Telephone Construction Company, Chicago, Illinois, is about to place upon the market its improved "Type X" telephone receiver. A patent has been applied for covering the new improvement which, as shown in illustration, consists of a perforated hard rubber button cast in the ear cap of the receiver. This affords complete protection against jamming and bending of the diaphragm, and also prevents moisture or dust from entering the shell and gathering upon the different parts of the receiver. Severe laboratory tests made during the past several months have been very satisfactory, demonstrating that this improvement is a valuable one and that it in no way impairs the distinctness of speech in receiving.

The receiver is but 5½ inches in length, and its whole construction is a model of workmanship. The magnets are of the horseshoe bi-polar type, with silk insulated wire coils mounted at the end of each pole. The magnets are adjustable longitudinally to or from the diaphragm, and means are provided for positively locking them when once adjusted. This perfect form of adjustment also guards against any bad effects that might possibly be caused by expansion or contraction of the shell, due to heat or cold. There is nothing metallic on the outside of this receiver, all metal parts of every kind being enclosed in

the rubber shell, consequently there is absolutely no possibility of a person receiving an electric shock while using this receiver. It is most complete in every detail, both electrically and mechanically, and will no doubt be used extensively by telephone users.

THE acquaintances of Mr. Albert Lynn Lawrence will be glad to learn of the relocation of his patent-law office in Cleveland, at 1410 Williamson building. Mr. Lawrence has become known to the electrical fraternity thru his connection with the patent soliciting and litigation of the Western Electric Company and the Siemens & Halske Electric Company, of Chicago.

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TELEPHONE NEWS.

NEWBURG, N. Y.—Colonial Telephone Company; capital stock, $125,000.

RICHMOND, VA.—The Southern Bell Telephone Company has been sued by the city of Richmond.

NEW WATERFORD, OHIO.—The Columbia County Telephone Company has been granted a franchise.

SHERMAN, TEX.—The United States Telephone Company is asking for a franchise. They agree to complete exchange in nine months and rent 'phones for $24 and $36.

HARRISON, OHIO.—The Harrison Telephone Company, of Harrison, Hamilton County, was incorporated by John L. Wallefeld, Alexis F. Burk, Robert P. Burk, John C. Bevis and Francis Nolowell. Capital stock $5,000.

JACKSON, MICH.—The Citizens' Telephone Company has completed a metallic-service line from Jackson to Horton and Hanover, and next spring the line will be continued to Moscow, Hillsdale and other neighboring towns.

DONALDSONVILLE, LA.—The local telephone plant at Crowley was purchased by the Cumberland Telephone & Telegraph Company from Johnson & Perkins, who had conducted it for the past four years. The price paid was $2,500.

BUFFALO, MINN.—The material for the new telephone exchange has been ordered and part of it is now on hand. The work of setting the poles will begin as soon as they arrive and the plant will be in operation by the first of January.

PHILADELPHIA, PA.—The Juniata and Susquehanna Telephone Company, to operate lines in Northumberland, Dauphin, Cumberland, Franklin, Perry, Snyder, Juniata, Mifflin, Huntingdon and Fulton counties. Capital stock, $1,000.

PORTLAND, IND.—The Pennville Telephone Company was organized last night, and will construct an exchange at once. Officers: President, F. E. Moyer; treasurer, W. M. Hall; secretary, Bee McCarthy, and manager, Jap Lineback.

RALEIGH, N. C.—Work has begun on a new telephone system at Sanford. The holes are being sunk for the posts. It is proposed by Mr. Will Wynn, who will build the system to connect Raleigh, Greensboro and Richmond, Virginia, with Sanford.

WINFIELD, IOWA.—The Winfield Telephone Company has filed articles of incorporation. The following officers have been elected: H. L. Glass, president; J. H. Teter, vice-president; J. Ed Huston, secretary, and B. B. Lindly, treasurer. The capital stock is fixed at $3,000.

ST. LOUIS, MO.—The Kinloch Telephone Company, a company organized by Adolph Busch, of St. Louis, in opposition to the Bell Telephone Company, now has twice as many patrons in St. Louis as the Bell Company. It is beginning to spread its business to other parts of the country.

LOUISVILLE, KY.—Mr. Ellis M. Coleman, president of the Coleman Brothers' Clothing Company, is at the head of the new telephone organization which has applied for a franchise to furnish telephone service to Louisville in opposition to the Cumberland Telephone & Telegraph Company.

BRYAN, TEX.—Charter filed, with capital stock of $12,000, to operate in Brazos, Burleson, Robertson, Madison and Leon counties. Incorporators, Spencer Ford, H. C. Robinson, John B. Mike, F. E. Gieseke and J. E. Butler. New poles and new switchboard will be erected and old exchange enlarged.

ELKHART, IND.—The Elkhart Telephone Company will construct a copper circuit from Goshen to Milford, where it will connect with the Independent line from Warsaw. A copper circuit is to be constructed from Warsaw to Indianapolis, thus giving Elkhart county direct communication with Indianapolis with only two connections.

GOSHEN, IND.—The Home Telephone Company, of Elkhart county, has decided to construct a full metallic line from Goshen to Milford, there to connect with the Warsaw Independent Telephone Company's line, recently purchased by Strauss & Co., of Ligonier, which firm will construct a direct independent line to Indianapolis.

AKRON, OHIO.—The stockholders of the Akron People's Telephone Company met and increased the capital stock of the company from $200,000 to $500,000. The company will make extensions thruout the city and county and will also put in an entire new switchboard at Barberton, and also enlarge the switchboard at Cuyahoga Falls.

EDINBORO, PA.—A Coöperative Telephone Association has been organized at Edinboro, to be operated in connection with the New York and Pennsylvania (Bell) Telephone Company, thereby securing the advantages of direct connection with the Bell Company's extensive toll-line system, and at the same time have the satisfactory privilege of retaining the profits made in the operation of the local exchange.

OSAGE, IOWA.—A new telephone company has been organized here thru the efforts of M. O. Tuttle, who has sold $5,000 worth of preferred stock to the professional and business men. The Waterloo Company has taken $5,000 in stock also. The new company will be operated under the name of the Mitchell County Telephone Company. It will connect with Waterloo and thru their lines will be able to reach about fifteen counties in the State.

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YOUNGSTOWN, OHIO.—An ordinance has been granted.

NELIGH, NEB.—A local telephone company has been organized.

BLUE RAPIDS, KAN.—Blue Rapids will put in a telephone exchange.

CARLETON, MO.—A farmers' mutual company has been organized.

INDEPENDENCE, WIS.—There is soon to be an Independent exchange here.

HICKSVILLE, OHIO.—The Boone Bevington Company; capital stock, $20,000.

CHARITON, IOWA.—A mutual telephone company has been organized here.

PORT CLINTON, OHIO.—A telephone exchange here is now open for business.

LAWRENCEVILLE, N. Y.—Southern Tier Telephone Company; capital stock, $1,000.

ATWOOD, KAN.—The council has granted a telephone franchise to W. C. McErwin.

CATTARAUGUS, N. Y.—Cattaraugus Telephone Company; capital stock, $1,000.

CEDAR RAPIDS, IOWA.—The Interior Telephone Company; capital stock, $10,000.

MANGUM, O. T.—The Independent exchange here will soon be ready to operate.

MECHANICSBURG, OHIO.—Mechanicsburg Telephone Company; capital stock, $25,000.

LIBERTY CENTER, OHIO.—Liberty Center Telephone Company; capital stock, $10,000.

METROPOLIS, ILL.—There is to be a war here between the Independent and Bell companies.

BLUE RAPIDS, KAN.—There is to be an Independent exchange constructed at this place.

LEHIGHTON, PA.—Overland Telephone Company, of Lehighton; capital stock, $15,000.

KENDALL, N. Y.—The Morton Telephone Company, of Orleans County; capital stock, $700.

ELIZABETH, PA.—The Federal Telephone Company has secured franchises in Brownsville.

PLEASANT PLAINS, ILL.—The West Sangamon Telephone Company; capital stock, $2,500.

SHERMAN, TEX.—A franchise has been granted for an Independent telephone exchange.

ROCHESTER, N. Y.—The Empire State Telephone Company has absorbed Sodus Exchange.

VANCOUVER, B. C.—A telephone cable is being stretched between Victoria and Vancouver.

STOCKTON, KAN.—The Greenleaf Telephone Company has established a local exchange here.

TOLEDO, OHIO.—The Toledo Telephone, Telegraph & Message Company; capital stock, $25,000.

SILVERTON, ORE.—Work on the Independent company's line here is being rapidly pushed forward.

FULTON, KY.—The Cumberland Company was refused a franchise to operate an exchange in Fulton.

CORNING, IOWA.—The Corning Telephone Company filed articles of incorporation; capital stock, $10,000.

GAFFNEY, S. C.—The Gaffney Telephone Company has been incorporated, with a capital stock of $10,000.

STEUBEN COUNTY, N. Y.—Steuben County Telephone & Telegraph Company, of Bath; capital stock, $2,000.

WOONSOCKET, MINN.—A local company has been organized to build and operate a telephone exchange here.

RALEIGH, N. C.—A charter is granted the American Telegraph & Telephone Company; capital stock, $15,000.

NILES, MICH.—The McComb County Telephone Company has been incorporated, with a capital stock of $50,000.

SULLIVAN, ILL.—Franchise has been granted to David Davis to erect and operate the telephone exchange.

PORT WASHINGTON, WIS.—The Sheboygan Telephone Company is building a number of toll lines in this locality.

PERU, IND.—Franchise has been granted an Independent company to build and maintain a telephone exchange.

COUNCIL BLUFFS, IOWA.—The Keokuk Telephone Company filed articles of incorporation; capital stock, $75,000.

WILMINGTON, DEL.—The United Telephone & Telegraph Company was incorporated at Dover today; capital stock, $2,000,000.

RIVERTON, PA.—The Brough Telephone Company has been granted a franchise to build and operate a telephone exchange.

ORVILLE, OHIO.—An ordinance granting the Starr County Telephone Company franchise to construct an exchange has been passed.

RIVERTON, PA.—The Burlington County Telephone Company was granted a franchise to build and maintain a telephone exchange.

SOLOMON, KAN.—An Independent telephone company has been granted a franchise to build and operate a telephone exchange.

MARQUETTE, MICH.—The directors of the Marquette County Telephone Company have declared a dividend of ten per cent on their stock.

PLYMOUTH, WIS.—The Summit Telephone Company, which has been granted a franchise to operate in this city, has been incorporated.

BLOOMINGTON, ILL.—The stockholders of the Minier Telephone Company have decided to go on with the development of the system. The company has about $15,000 invested.

ST. MICHAEL, ALASKA.—Telephonic communication has been established between St. Michael and Nome City by means of a temporary submarine cable. The toll is $2 for ten words.

BALTIMORE, MD.—Maryland & Delaware Telephone Company has been organized to maintain and construct telephone and telegraph lines. It is a concern with a capital stock of $50,000.

HENDRYSBURG, OHIO.—W. A. Kline completed arrangements for connecting his telephone line with that of the Central District & Printing Telegraph Company. Mr. Kline has a line from Hendrysburg to Sewellsville and connections with many of the farmers'

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residences in that vicinity. He will put in a new switchboard at once.

NILES, OHIO.—The city will equip its police patrol boxes with telephones.

CALDWELL, OHIO.—The telephone exchange here is rapidly increasing its capacity.

GALESBURG, ILL.—Galesburg Union Telephone Company; capital stock, $100,000.

SALT LAKE, UTAH.—The new Independent system is to be a central energy system thruout.

LOWELLVILLE, OHIO.—The council granted a franchise to an Independent telephone company.

JESSAMINE COUNTY, KY.—Nicholasville Home Telephone Company; capital stock, $10,000.

BERLIN, WIS.—The Waupaca city council repealed the franchise of the Badger Telephone Company.

FAYETTE, TEX.—The Fayette County Telephone Company has been granted a charter; capital stock, $5,000.

SODUS, N. Y.—The Empire State Telephone Company has absorbed the Sodus local telephone exchange.

SALAMANCA, N. Y.—The Independent telephone company is pushing the work on its exchange here very rapidly.

QUINCY, ILL.—The Liberty, Plainville & Hull Telephone Companies are trying to get into this city with their lines.

DETROIT, MICH.—The Bell Company will have a very lively opponent in the field in the People's Telephone Company.

PITTSBURG, PA.—The Allegheny exchange of the Pittsburg & Allegheny Telephone Company is now open for business.

CANTON, ILL.—An Independent telephone company has been granted a franchise to build and maintain an exchange.

COALPORT, PA.—The Northern Pacific Railroad has decided to substitute the telephone for its present telegraph system.

OSNABURG, OHIO.—The council of the village of Osnaburg has granted a franchise to the Stark Telephone Company.

LOUISVILLE, KY.—The Board of Public Works advertise the sale of a franchise for a new telephone system in Louisville.

OWENSVILLE, KY.—The Cumberland Telephone Company, of Nashville, Tenn., has bought out the Carlisle Telephone Company.

SEATTLE, WASH.—Franchise has been granted an Independent telephone company to erect and maintain a telephone exchange.

STREATOR, ILL.—An Independent telephone company has been granted a franchise to build and maintain a telephone exchange here.

NELIGH, NEB.—The Northwestern Telephone Company, with headquarters at Neligh, has just been organized, with a capital of $10,000.

KNOXVILLE, TENN.—The Southern Telephone Construction Company has been organized in this city, with W. O. Rhode and W. S. Roberts of this city and C. L. Meyers, of Nashville, as executive officers. They have until recently been with the Cumberland Telephone Company in official capacities. They say they will build Independent telephone companies all over the South and in Mexico.

WARRENSBURG, ILL.—An Independent telephone company has been granted a franchise to build and operate a telephone exchange here; capital stock, $5,000.

KNOXVILLE, TENN.—The Southern Telephone Construction Company has been organized and will build Independent exchanges thruout this part of the country.

WILMINGTON, DEL.—Maryland and Delaware Telephone & Telegraph Company, of Baltimore; to maintain and construct telephone and telegraph lines; capital stock, $50,000.

BUSHNELL, ILL.—It is estimated that there are over eight hundred farmers' mutual telephone lines in Fulton, Knox, Ward, Mercer, Henry, Rock Island, Stark, Peoria and Henderson counties.

CITY OF MEXICO.—Mexican telephone reports for November $16,153 gross, increase $2,691, and $7,181 net, increase $2,398. The company has 3,358 subscribers, having gained 1,293 since March.

BALTIMORE, MD.—The city has received $6,000 from the Chesapeake & Potomac Telephone Company as rent occupied in the city streets by the company's private subway, the rate fixed by the ordinance being 30 cents per foot.

SOUTH BEND, IND.—The United States Long-Distance Telephone Company is filing a mortgage for $1,000,000 in DeKalb, Noble, Elkhart and St. Joseph counties, where its lines extend. The mortgage is in favor of the Cleveland Trust Company.

PHILADELPHIA, PA.—The Interstate Telephone Company, operating a line between Trenton and Norristown, has secured options on a majority of the stock of the Standard Telephone Company, which connects Newton, Langhorne, Yardley and Doylestown.

DEKALB, ILL.—A trust deed was filed for record in the recorder's office on Saturday, for $250,000. It was given by the Northern Illinois Telephone Company, of Sandwich, Illinois, to S. P. Sidzwich, trustee, to secure the payment of 500 bonds of $500 each.

BRITT, IOWA.—The Western Electric Telephone Company has purchased the entire stock of the Iowa and Nebraska Telephone Company, valued at $100,000. This includes the exchanges at Sheldon, Sibley, Estherville, Spirit Lake and Cherokee. The Western Company operates 2,700 miles of line in this State, Minnesota and the Dakotas.

KEOKUK, IOWA.—Articles of incorporation of the Keokuk Telephone Company have been filed in the county recorder's office. It is organized for the purpose of operating the telephone system built and owned by J. C. Hubinger. The first board of directors includes J. C. Hubinger, J. K. Berry and V. M. Hubinger. The capital stock is $75,000, and the corporation is empowered to begin business when $25,000 worth of stock is subscribed.

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INDEPENDENT ORGANIZATIONS.

Upon this page will appear the news of the Independent Associations.

ILLINOIS TELEPHONE ASSOCIATION.

A meeting of the Illinois Telephone Association will be held at Champaign, Illinois, February 6, at 2:30 P.M. You are requested to be represented at this meeting, as there is very important business to be considered, that will be of great importance to all Independent telephone interests. This is not for the Telephone Association interests, but for the benefit of the telephone companies in Illinois. There will be a program, of which papers will be read of much interest. Remember that all who attend will be greatly benefited, and we will expect to see you there.

Yours respectfully,

W. B. BURKE, *Secretary.*

SOUTHERN OHIO INDEPENDENT TELEPHONE ASSOCIATION.

At a meeting held at the Cherry Hotel, Washington Court House, Ohio, on the 16th instant, the Southern Ohio Independent Telephone Association was organized for the mutual interests of the local Independent telephone companies in Ohio south of a line east and west thru Columbus.

Mr. G. P. Thorpe, secretary The Clinton Telephone Company, Wilmington, Ohio, was chosen president, and I. S. Henkle, secretary Mount Sterling Telephone Company, was made secretary.

An executive committee of three was elected, consisting of the following-named persons:

Charles D. Duncan, secretary The Home Telephone Company, Chillicothe, Ohio; F. W. Peirce, secretary The London Telephone Company, London, Ohio; Jerome Penn, vice-president The Citizens' Telephone Company, Washington Court House, Ohio.

The next meeting of the association will be upon call of the executive committee.

ILLINOIS MANAGERS MEET.

At Pickneyville a meeting of telephone managers of southern Illinois was held. Among those from out of town in attendance were E. Bledson, of St. Louis; James Sproul, Jr., of Sparta; D. W. Parkinson, of Carbondale; A. G. Gordon, of Chester; Ed Rich, of Ridgway; John C. Stokes, of Carmi; F. H. Stamper, of Benton; Charles De Tempt, of Rileyville; J. B. Bundy, of Carbondale, and George O. Dean, of Ava. A matter under consideration was that of making a connection with St. Louis.

KANSAS TELEPHONE COMPANIES UNITE.

The Independent telephone companies of Kansas organized here, January 8, under the name of the Kansas Independent Telephone Association. S. C. Crummer, of Beloit, was elected president, and W. W. Dilworth, of Beloit, secretary. About thirty delegates were present, representing 5,900 'phones and over 1,500 miles of toll line. Every part of the State except the extreme northeast and southeast portions was represented.

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WANTED.

COMMENCING WITH THE DECEMBER ISSUE, we will add to our paper want columns, which will appear on this page under the heading of "WANTS." They will be classified under the following heads:

HELP WANTED,
SITUATIONS WANTED,
STOCK WANTED,
CAPITAL WANTED,
EXCHANGES FOR SALE,
MATERIAL FOR SALE and
MISCELLANEOUS WANTS.

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Telephone Magazine

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VOL. XVII. CHICAGO, MARCH, 1901. NO. 114.

VICTORY!

Judge Brown, of the United States Circuit Court of Massachusetts, has decided against the American Bell Telephone Company in the famous Berliner patent case.

The people of the United States are to be congratulated upon the decision of Judge Brown in the United States Circuit Court of Massachusetts, in which he decides against the Bell Telephone Company's contention for the exclusive right to the use of the transmitter and receiver of the telephone for conversation.

With a despotism which has never been able to successfully attain or hold its desired ends, the greedy Bell Telephone Company has sought for years, after the expiration of its legal patent protection, to keep its extortionate grasp upon the telephonic communication of eighty million people in the United States.

The Bell Company as a monopoly is a thing of the past. Its iniquitous suit has been held in the courts as long as possible by the dilatory methods of the Bell Company for the purpose of intimidating capital and keeping timid investors from taking up and extending the independent use of telephones in exchanges and toll lines, making them a convenience and necessity within the reach of all, instead of an extravagance and luxury within the reach of only a few, as the Bell Company would have made them.

Realizing that they had no hope to stand in the slightest favor with popular public opinion, the Bell people had become desperate and shameless in their attempts to perpetuate for double its rightful length of time the patent monopoly they so exclusively and so profitably enjoyed previous to the year 1891. Such an attempt at mutiny against justice; such a travesty toward equity and such unblushing effrontery in attempting to evade the rights and pervert the liberties of the people under the cloak of legal protection had never been before pressed so vigorously in the Patent Office at Washington and in the annals of jurisprudence in the courts of the United States, and the court, as well as the people of the United States, is to be complimented upon the wisdom and justice of the decision.

The case was that of the American Bell Telephone Company versus the National Telephone Manufacturing Company and the Century Telephone Company, and has been before the court since August, 1895, when the bill was filed. Arguments were begun in the case on November 7 and finished on November 14, 1899. The substance of the decision rendered is as follows:

"The decree in this case must be for the defendants. I find the Berliner patent invalid, because at the date of application, June 4, 1877, Berliner had

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not made the invention covered by the patent issued to the American Bell Telephone Company on November 17, 1891. It is conclusive that Berliner had not invented and did not intend to apply for a patent for a constant-contact speech transmitter.

"I find, as a matter of fact, that Berliner did not, before June 4, 1877, succeed in transmitting speech, but, on the contrary, was convinced by his experiments that speech could not be transmitted by the apparatus of the patent in suit. I find also that he did not at that date intend to describe or claim the apparatus as a speech transmitter."

The second ground of the decision is that the invention described in the patent is radically different from the invention described in the application. On this point the court says:

"A comparison of the two documents leaves no doubt on this question. The application expressly disclaims speech transmission by the instrument of the patent; and claims as a speech transmitter a double-pin instrument, operating to make and break contact of electrodes. The patent calls for constant contact of electrodes and unbroken current; the application for an interrupted contact and a broken current.

"The original application by changes purporting to be amendments has been completely transformed into an application for a distinct invention. This transformation is of the most remarkable character and was made after Edison's carbon constant-contact speech transmitter was invented and described in a printed publication. Such amendment is illegal, even if Berliner had made the invention before June 4, 1877."

The third ground of the decision is to the effect that the invention was previously patented by Berliner, who in 1880 took out a patent which covered the speech transmitter of the patent in suit, applied to its appropriate use in a "system," namely, with a receiver. By granting the patent of 1880 the commissioner exhausted his power to issue a second patent whereby the patentee could control all use of this instrument as a transmitter. Having been protected for seventeen years in the use of this transmitter with one receiver, Berliner was not entitled to further protection for use with any and all receivers.

The fourth ground is that Edison was the prior inventor. August 8, 1887, is the earliest date of Berliner's amendment affecting this controversy. Berliner's amended application is anticipated by Edison's application of April 20, 1877, and by the Philadelphia *Press* article of July 9, 1877. The burden of proof is upon the complainants to anticipate Edison. They can not sustain it. Assuming Berliner's application as of date of June 4, 1877, he is anticipated by Edison's application of April 20, 1877.

"The claims, which cover all forms of variable contact transmitters, are embraced in the Bell patent as well as in Bell's liquid transmitter, and in various devices of Edison's. The patent discloses nothing patentable as an art, method or mode of operation.

The court concludes: "I am of the opinion that the defendant's transmitters are an invention substantially distinct from that disclosed in the Berliner patent; that the conception by Edison of the use of carbon for speech transmission preceded Berliner's conception of the use of solid metallic electrodes; that from his first conception Edison diligently proceeded upon a line of experiments that led to an invention of remarkable character which borrows nothing from Berliner, has no substantial resemblance to what is shown in the Berliner patent and can not be identified with it by any ingenious use of language. The defendants owe nothing to Berliner. The bill is dismissed."

Judge R. S. Taylor, of Fort Wayne, Indiana, who conducted the defense for the Independents, said:

"The decision made in Boston today is in two suits brought by the Bell Telephone Company against independent manufacturers of telephones upon a patent granted to Emile Berliner November 17, 1891. The patent covers in the broadest terms what is known as the microphone, a form of telephone transmitter in universal use. It differs from the form of the transmitter invented by

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Bell and described in his patent of 1876, and in an improved form in his patent of 1877. The microphone was introduced into use as the invention of Thomas A. Edison in 1878. During that year an interference in the Patent Office, to which there were a great number of parties, disclosed the fact that Emile Berliner had in the office an application filed in June, 1877, in which could be perceived by the Bell Company's experts some suggestions which, by suitable alteration and expansion, could be made to cover the idea of the microphone. The Bell Company bought the application, changed it so as to make it describe the microphone, then kept it in the Patent Office until 1891, when it took out the present patent. I am advised by my associates that the opinion of the court sustains the first, second, third, fourth and fifth defenses completely. Such a decision destroys the patent, root and branch."

The report of this decision reached the New York Stock Exchange about 3 o'clock February 27, and the stock of the American Telephone & Telegraph Company, the parent Bell, fell from 163 to 156½, and at the time of going to press the stock was down to 155, with few buyers. Prior to the decision the stock was heavily traded in.

According to the way the Bell people were trying to prove their claims the Berliner does not expire until November 17, 1908. It was issued on November 17, 1891, altho application had been filed on this patent June 7, 1877. There are over one hundred instances where priority claims could be made to stand in the patent issued on November 17, 1891, some of these patents were even in the possession and owned and controlled by the Bell Company. If their contention which they had tried to establish was a just one, they perforce have been bluffing, coercing the people for ten years prior to the issuing of this patent in 1891. This patent is the same one that has been before the courts in the United States versus the Bell Telephone Company, where it was held that the patent was not invalid on account of delay at the Patent Office.

We give in full both Berliner patents and drawings.

It will be noted that the drawings of the invention in the two patents are alike in all particulars, barring simple differences in expression, such as would inevitably result when two writers refer to the same subject. The specifications are alike in describing the same *device;* the only difference being that in the claims of one patent the *device* is called a " transmitter " and in the other a " receiver. In both patents Figs. 1 and 2 are lettered exactly alike, connections are the same, and there is nothing to indicate which is the transmitter and which the receiver. As a matter of fact, according to the description, each would be both, *and would have to be so* in the 1880 patent in order to justify the fourth claim for a system.

In the 1891 patent no distinction is made showing any difference in the two instruments described. " *Transmitting sound along a line of an electric current,*" as italicized in the preamble to the specification, necessarily means the use of a transmitter and a receiver. " *By placing now, one such instrument in the station, etc.,*" evidently has the same meaning. But as the two instruments are identical, we may take either. In his description of the figures in this patent, Berliner goes on to say: " Fig. 5, a view of the diaphragms arranged to receive and transmit the sound waves."

The same description is given in the 1880 patent.

Berliner Patent No. 233,969, Issued November 2, 1880.

My invention consists in a new and useful improvement in telephonic receivers for producing sound by means of varying electrical currents, of which the following is a specification.

It is a fact and a scientific principle that if two electrodes be placed in contact to form part of a circuit and a current of electricity be passed thru them, a repulsion is exerted between them. Based on this fact, I have constructed a simple receiver for an electric telephone apparatus.

In Fig. 2 of the drawings, A is a metal plate well fastened to the wooden box or frame, but able to vibrate. Against the plate and touching it is the metal ball *c*, terminating the rod B, which rests on the bar or

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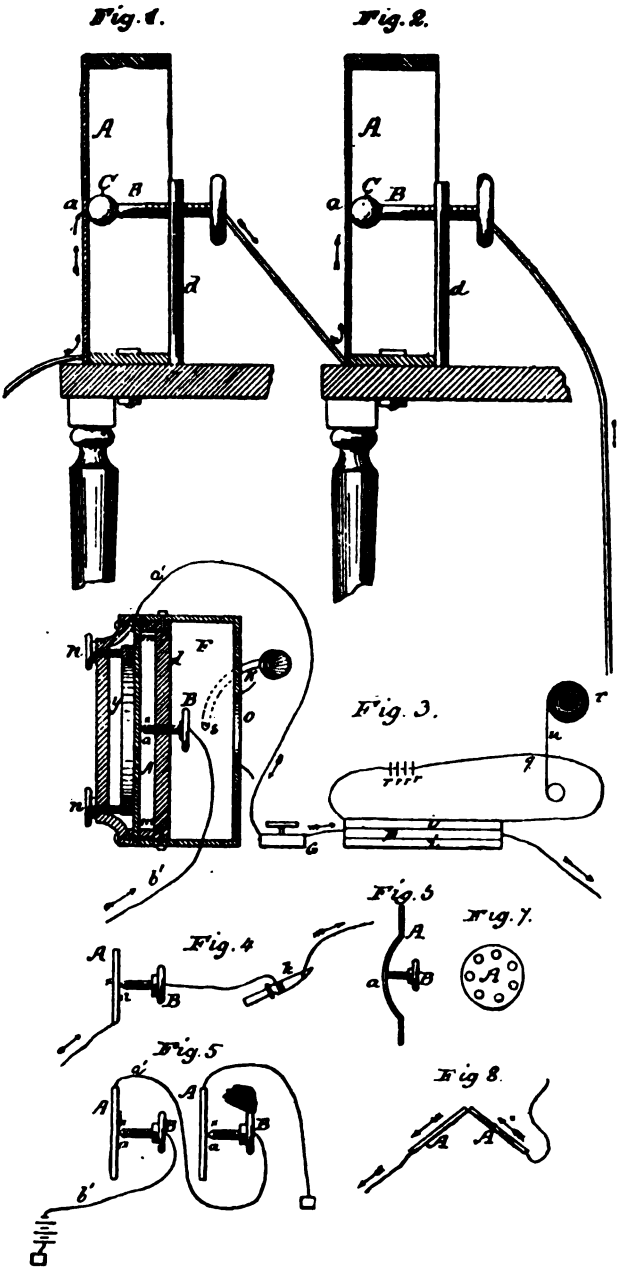

FIG. 1. FACSIMILE BERLINER PATENT DRAWINGS, ISSUED NOVEMBER 17, 1891.

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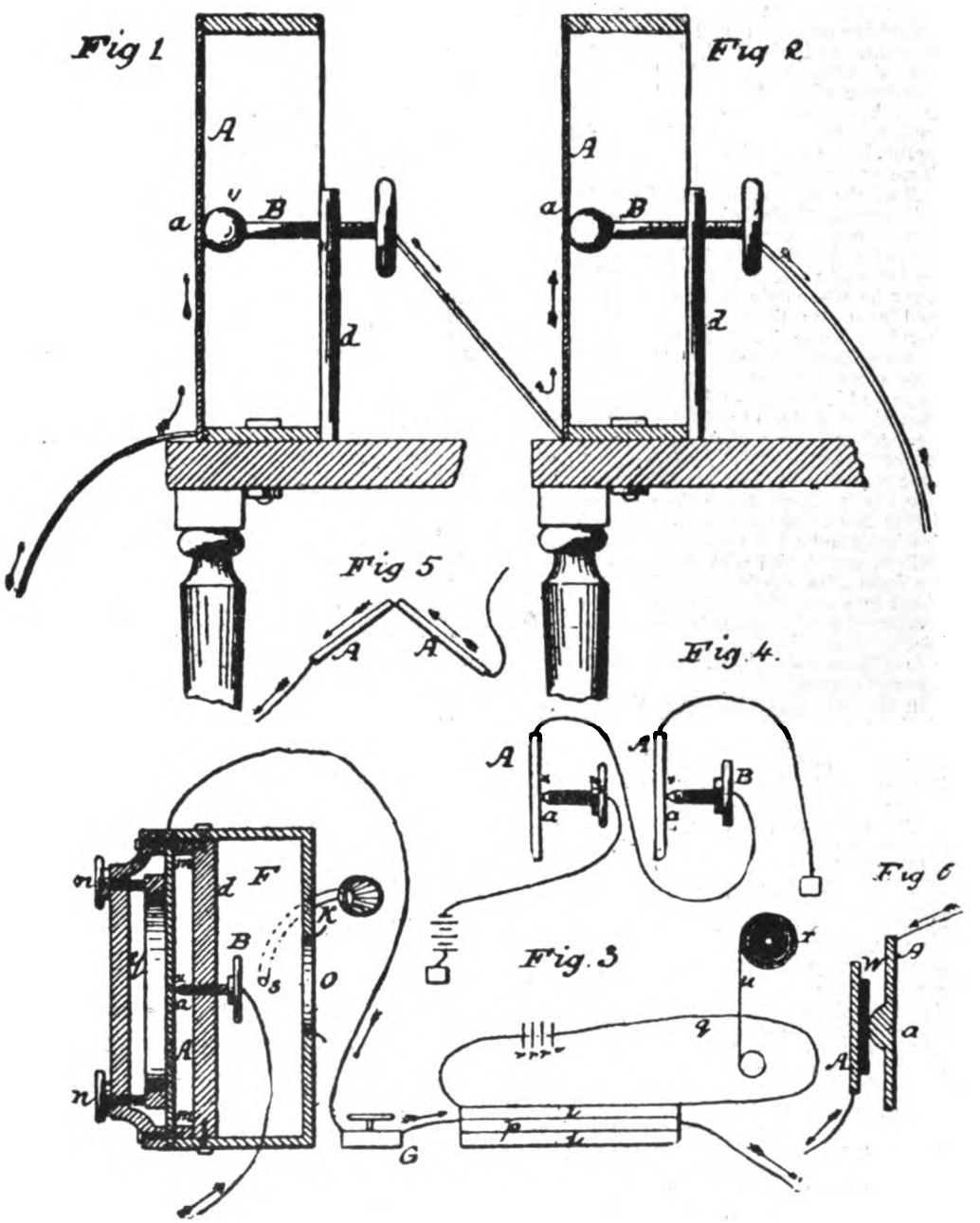

FIG. 2. FACSIMILE BERLINER PATENT DRAWINGS, ISSUED NOVEMBER 2, 1880.

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stand *d* and presses against the plate, which pressure, however, can be regulated by the thumb-screw attached to the ball.

If a current of electricity passes thru the plate and the point of contact, or vice versa, a repulsive movement will take place between the plate and the ball, because both are charged with the same kind of electricity. This force of repulsion may be weakened or strengthened by varying the strength of the current. As that strength is varied by any appropriate form of electric speaking telephone transmitter (especially that shown at A B of the various figures of the drawings, and more particularly described and claimed by me in another application filed June 4, 1877, of which this is a division), so will also the force of repulsion at the point in the receiver be alternately weakened and strengthened as many times accordingly, and will therefore cause its plate to vibrate at the same rate and measure. The latter vibrations being communicated to the surrounding air, the same kind of sound as uttered against the transmitter (Fig. 1) will be reproduced at the receiver (Fig. 2), or in as many other receiving instruments as are situated within the same electric circuit.

In Fig. 2 I have shown the receiver as consisting of a diaphragm in contact with a ball. In Figs. 3 and 4 I show it as somewhat differently mounted, and with the contact piece in the form of a pin instead of a ball, and in Fig. 6 in a still different form with a carbon contact. In this figure, W is a piece of carbon.

In Fig. 5 two plates in contact at their edges are shown.

In the drawings, the letter A represents a diaphragm or plate, preferably of thin metal of limited conductive capacity, such as iron, steel, German silver, platinum, and also carbon secured in the frame *m m* in the box *f* in any convenient manner.

The letter *y* represents a ring resting against one side of said diaphragm, and capable of being made to bear upon the same with more or less force by means of set-screws *n*, in order that the tension of the diaphragm may be regulated.

The letter B represents a screw or piece of metal or carbon, pointed at one end and mounted in a cross-piece *d* in such position that the point will be in contact with the diaphragm A. The diaphragm A is connected with one pole of a battery by means of a wire, and the pin or screw B with the other pole.

Fig. 4 shows the manner in which the complete apparatus, consisting of the transmitter A B and the receiver A B, is connected up in circuit.

It will be observed that the transmitter is of the same construction as the receiver. When a sound is uttered in the neighborhood of the transmitter its plate will vibrate accordingly, and the pressure between the plate and the pin or ball at the point of contact *a* will become weaker or stronger, according to the vibrations, and this variation of pressure will cause the current passing to become weaker or stronger, and thus effect the changes which operate the receiver, as already described.

As shown in Fig. 3, the box *f* is provided with a tube K to which the ear of the operator may be applied in order to hear the sounds produced by the vibratory diaphragm when the instrument is employed as a receiver, and a tube O thru which he can speak when employing the instrument as a transmitter, so that the operator is not in need of moving the instrument or moving his head while carrying on a conversation. This combination, with the sound chamber of a telephone provided with the usual sound passage or mouthpiece, of an additional sound-conveyor or hearing-tube, forms, however, no part of the invention.

I claim:

1. The herein described method of producing sound vibrations in a plate by causing a varying electric current to pass to the plate, or to an electrode connected therewith, from a second electrode in contact therewith, substantially as described.

2. An apparatus for producing sound by means of a varying electric current, which consists of a plate forming or carrying an electrode placed in contact with another electrode, from one to the other of which the electric current is caused to pass.

3. An electric telephone receiver to be operated by varying electric currents, and consisting of two contact-pieces within an electric circuit, one or both of which pieces consist of or are connected with a vibratory diaphragm, whereby one electric current passing thru said circuit exercises a repulsion between said two electrodes corresponding to its strength, and thus produces corresponding motions in the diaphragm.

4. A system of two or more telephone instruments in electrical connection with each other, each consisting of two or more poles of an electrical circuit in contact, one with the other, either or both poles of each instrument being connected with a vibratory plate, so that any vibration which is made at one contact is reproduced at the other, substantially as set forth.

In testimony whereof, I have signed this specification in the presence of two subscribing witnesses.

EMILE BERLINER.

Witnesses:
C. H. GREAVES.
ALFRED J. MAYO.

Berliner Patent, No. 463,569, Issued November 17, 1891.

My invention consists in a new and useful improvement in transmitters for electrically transmitting sound of any kind, of which the following is a specification.

It is a fact that if, at a point of contact between two conductors forming part of an electric circuit and carrying an electric current, the pressure between both sides of the

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contact becomes weakened, the current passing becomes less intense — as, for instance, if an operator on a Morse instrument does not press down the key with a certain firmness, the sounder at the receiving instrument works much weaker than if the full pressure of the hand had been used. Based on this fact, I have constructed a simple apparatus for transmitting sound *along a line of an electric current* in the following manner:

In Figs. 1 and 2 of the drawings, A is a metal plate well fastened to the wooden box or frame, but able to vibrate if sound is uttered against it or in the neighborhood of said plate. Against the plate and touching it is the metal ball C, terminating the screw-threaded rod B, which is supported by the bar or stand *d*. The pressure of the ball C against the plate A can be regulated by turning the rod B. The said ball and plate are included in circuit with an electric battery, so that they form electrodes, the current passing from one of them to the other. By making the plate vibrate, the pressure at the point of contact *a* becomes weaker or stronger as often as vibrations occur, and the strength of the current is thereby varied accordingly, as already described. *By placing now,* as is shown in the drawings, *one such instrument* in the station Fig. 1, and another instrument capable of acting as a telephone receiver in the station Fig. 2, both situated on the same electric circuit in which a current is passing (as shown by the wire connections following the arrows), sound uttered against the plate of the instrument Fig. 1 will be reproduced by the plate of the instrument Fig. 2, for as the vibrations of the transmitter Fig. 1 caused by the sound will alternately weaken and strengthen the current as many times as vibrations occur, the diaphragm of the receiver will be caused by these electrical variations to vibrate at the same rate and measure. The latter vibrations being communicated to the surrounding air, the same kind of sound as uttered against the transmitter Fig. 1, will be reproduced at the receiver Fig. 2, or in as many other receiving instruments as are situated within the same electric circuit.

It is not essential that the plate should be of metal. It can be of any material able to vibrate, if only at the point of contact suitable arrangement is made so that the current passes thru that point. The plate may be of any shape or size, or other suitable vibratory media may be used — a wire, for example. Any other metallic point, surface, wire, etc., may be substituted for the ball. There may be more than one point of contact to be affected by the same vibrations. Both of the electrodes may vibrate, altho it is preferable that only one should. If the uttered sound is so strong that its vibrations will cause a breaking of the current at the point of contact in the transmitter, then the result at the receiving instrument will be a tone much louder, but not as distinct in regard to articulation.

I have also embodied my invention in and used it in connection with some other forms of apparatus.

In the drawings, Fig. 4 represents a detached view of the vibratory diaphragm, showing its relative situation to the poles of the galvanic current; Fig. 3 represents a view of a complete apparatus; Fig. 5 *a view of the diaphragms arranged to receive and transmit the sound waves;* and 6, 7 and 8 modifications of the vibratory diaphragm.

In the drawings, the letter A represents a diaphragm or plate of thin metal, of limited conductive capacity, such as iron, steel, German silver, platinum, secured in the frame *m m* in the box F in any convenient manner.

The letter *y* represents a ring resting against one side of said diaphragm and capable of being made to bear upon the same with more or less force by means of set-screws *n*, in order that the tension of the diaphragm may be regulated.

The letter B represents a screw or pin of metal, pointed at one end and mounted in a cross-piece *d* in such position that the point will be in contact with the diaphragm A. The diaphragm A is connected with one pole of a battery by means of a wire *a'*, and the pin or screw B with the other pole by means of a wire *b'*.

The box F, of Fig. 3, is provided with a tube K, to which the ear of the operator may be applied, in order to hear the sounds produced by the vibratory diaphragm when the instrument is employed as a receiver, and a tube O thru which he can speak when employing the instrument as a transmitter, so that the operator is not in need of moving the instrument or moving his head while carrying on a conversation.

Instead of employing a single vibratory plate, as shown in Figs. 1, 2, 3, 4 and 5, in each instrument, two such plates may be employed, as illustrated in Fig. 8, said diaphragms being connected to the respective poles and in contact with each other at their edges, as shown in Fig. 8.

The diaphragm of my improved receiver, or the diaphragm of any magneto receiver (such as those described by Alexander Graham Bell, in his patent, No. 174,465, of March 7, 1876, and in his patent, No. 186,787, of January 30, 1877), will receive a particularly strong shock at the setting in and sudden cessation of the current, when a ticking sound will be heard from the plate; but a weakening of the current alone can also be observed most distinctly and accurately by making, for example, a connection within the same circuit by a wire and the blade of a knife *k*, Fig. 4. When scraping the wire end over the blade of the knife, this scraping is distinctly audible on the plate. Here the current is never entirely interrupted, yet the minute elevations and cavities on the blade, caused by the structure of the steel, and which again cause minute alterations in the intensity of the current, are sufficient to shake or vibrate the plate with varying intensity, thus rendering again the same peculiar scraping noise. If, now, the plate of one instrument, as in Figs. 1 or 5, is vibrated by

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sound waves (which happens whenever any kind of sound is uttered or is produced by musical instruments in its neighborhood), every wave or vibration that strikes the plate produces between the two sides of the contact a variation of pressure, which causes a variation of resistance at that point, and therefore a variation in the strength of the passing current, and if the sound is sufficiently strong, it will break the circuit at said point of contact, the variations in the current thus produced causing similar vibrations in the plate of the receiving instrument. The essential part of the apparatus is the point of contact, which must offer a resistance to the current.

It is not necessary in the transmitting apparatus that the plate should be of conducting material, for any substance capable of vibration will answer, if only at the point of contact provision is made for the current to pass. It is sometimes convenient to use a vibrating plate in the form of a reflector, as shown in Fig. 6, for concentrating the sound, or the diaphragm may be provided with a number of apertures to disperse the sound, as shown in Fig. 7. These apertures prove advantageous with strong sounds, particularly the hissing sounds, as while the sound waves are rushing toward the diaphragm, those touching the plate are repelled and partially destroy the following waves, just as sea waves when forced against a cliff will be thrown back, destroying those directly behind. The holes permit most of the waves to pass to the other side of the plate, making the vibration of the plate more perfect and even.

It will be observed that in Figs. 1 and 2, one of the electrodes presents a convex curvilinear surface, like a rounded knob. This possesses some advantages, among which are ease of construction and durability, because it does not wear away the opposing electrode as much as a sharp one would, and when the contact with the vibrating body is made of such a form, the freedom of the vibration is less interfered with.

I do not claim that I am the first inventor of the art of transmitting vocal and other sounds telegraphically by causing electrical undulations similar in form to the sound waves accompanying said sound. Neither do I claim that I am the first who caused such electrical undulations by varying the resistance of an electric circuit in which a current was passing.

I do not herein claim the novel form of vibratory-plate receiver which I have described, because that is a subject of claim in another application.

I claim:

1. The method of producing in a circuit electrical undulations similar in form to sound waves by causing the sound waves to vary the pressure between electrodes in constant contact so as to strengthen and weaken the contact and thereby increase and diminish the resistance of the circuit, substantially as described.

2. An electric speaking telephone transmitter operated by sound waves and consisting of a plate sensitive to said sound waves, electrodes in constant contact with each other, and forming part of a circuit which includes a battery or other source of electric energy and adapted to increase and decrease the resistance of the electric circuit by the variation in pressure between them caused by the vibrational movement of said sensitive plate.

3. The combination, with the diaphragm and vibratory electrode, of a rigidly held opposing electrode in constant contact with the vibratory electrode, substantially as described.

4. In a telephonic transmitter, a vibrational plate made concave for condensing the sound, substantially as set forth.

5. In a telephonic transmitter, a vibrational plate, provided with one or more apertures, as and for the purposes set forth.

6. A speaking-telephone transmitter comprising a diaphragm or disk sensitive to sound waves, combined with a rigidly held but adjustable electrode in contact with the same, whereby the electric current is transformed into a series of undulations corresponding with the vibrations of said diaphragms.

In testimony that I claim the foregoing I have hereunto set my hand in the presence of the subscribing witnesses.

EMILE BERLINER.

Witnesses:
J. A. RUTHERFORD.
JAMES L. NORRIS.

A CO-OPERATIVE SYSTEM.

The coöperative telephone system at Grand Rapids, Wisconsin, seems to thrive. The city has enjoyed a service that is not only efficient, but remarkably cheap. The company was organized in 1896, with a capital stock of $5,000, divided into shares of $60 each. Any person could become a member of the combination by subscribing for one or more shares and by leasing one telephone for each share of stock. The company was thus to be controlled by the telephone renters and for their sole benefit. The company now rents 300 telephones and has increased its capital stock to $10,000. The rents are uniform, being established at first at $2.50 per month for business houses and $1.50 for residences, and after six months a dividend of one per cent a month was declared. After eighteen months the rates were reduced to $2.25 and $1, and the dividends were increased to 1½ per cent a month. The net cost of service to each of the renting stockholders shows a cost of $24 a year for business houses and $7 per year for residences.

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Telephone Magazine

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VOL. XVII. CHICAGO, MARCH, 1901. NO. 114

TELEPHONE SWITCHBOARDS.

BY H. P. CLAUSEN.

(*Continued.*)

Referring to the first diagram of Fig. 11 it will be observed that the A P and C P plugs are connected together by means of a cord circuit, the calling tip side of which is normally severed at K. The battery B connects to the sleeve and tip side of the calling plug thru windings placed upon the target signal C. The operation is as follows: The operator places the A P plug into the caller's line jack and inquires as to his needs. Thus, while this plug remains in the caller's line jack there is no action produced in the signal S. Then upon the operator placing the calling plug into the called-for party's line jack, the signal S still remains unaffected; but the moment the called-for party responds he completes a circuit from the battery B thru the coils C and causes the armature P to be attracted, which results in connecting A with K, thus establishing a completed tip circuit. After this has taken place the signal S will remain hidden until both of the connected subscribers have signified their desire for a disconnection by replacing their receivers to the switch hook.

In the second diagram a system is shown differing somewhat in operation from that shown by the fourth and sixth diagrams of Fig. 10. The operation is as follows: Answering plug being placed into the caller's line jack, it results in energizing the magnet C and drawing up the armature A, which is connected to the resistance S R and by making contact with K shunts out the lamp L from a circuit established from the battery B, resistance G R, plug contact R, jack contact R J and coil C″ to earth. Upon placing the calling plug into the caller's line jack, the plug contact R′ making contact with the jack contact R J′ results in lighting the lamp L′ thru the resistance G R′, this lamp being extinguished the moment the armature A′ is attracted by the relay C′, which occurs when the called-for subscriber responds. With this system there is a considerable waste of current during the time the parties are in conversation, owing to the fact that current is passing thru both lamps and both S R shunt coils as shown. In order to overcome this objectionable feature a system has been designed in which a saving of current is effected. Thus briefly referring to the third diagram, the relay C attracts the armature A and instead of shunting out the lamp it sends current from the battery B L thru the relay D which, upon becoming energized, draws its armature B up and thus opens the lamp circuit L. The provision of the additional relay and battery B L, however, can hardly be considered as an advantage over the second system when viewed from a practical standpoint, disregarding, of course, its economical features in the use of current. In the fourth diagram a complete cord circuit embodying features of the second and third systems is shown. The operation of this system is unnecessary to describe, for it is similar to that of the preceding circuits.

Setting aside for the time being further reference to common battery multiple switchboards and appliances, let us discuss the means which have been devised by manufacturing companies for giving service to a large number of tele-

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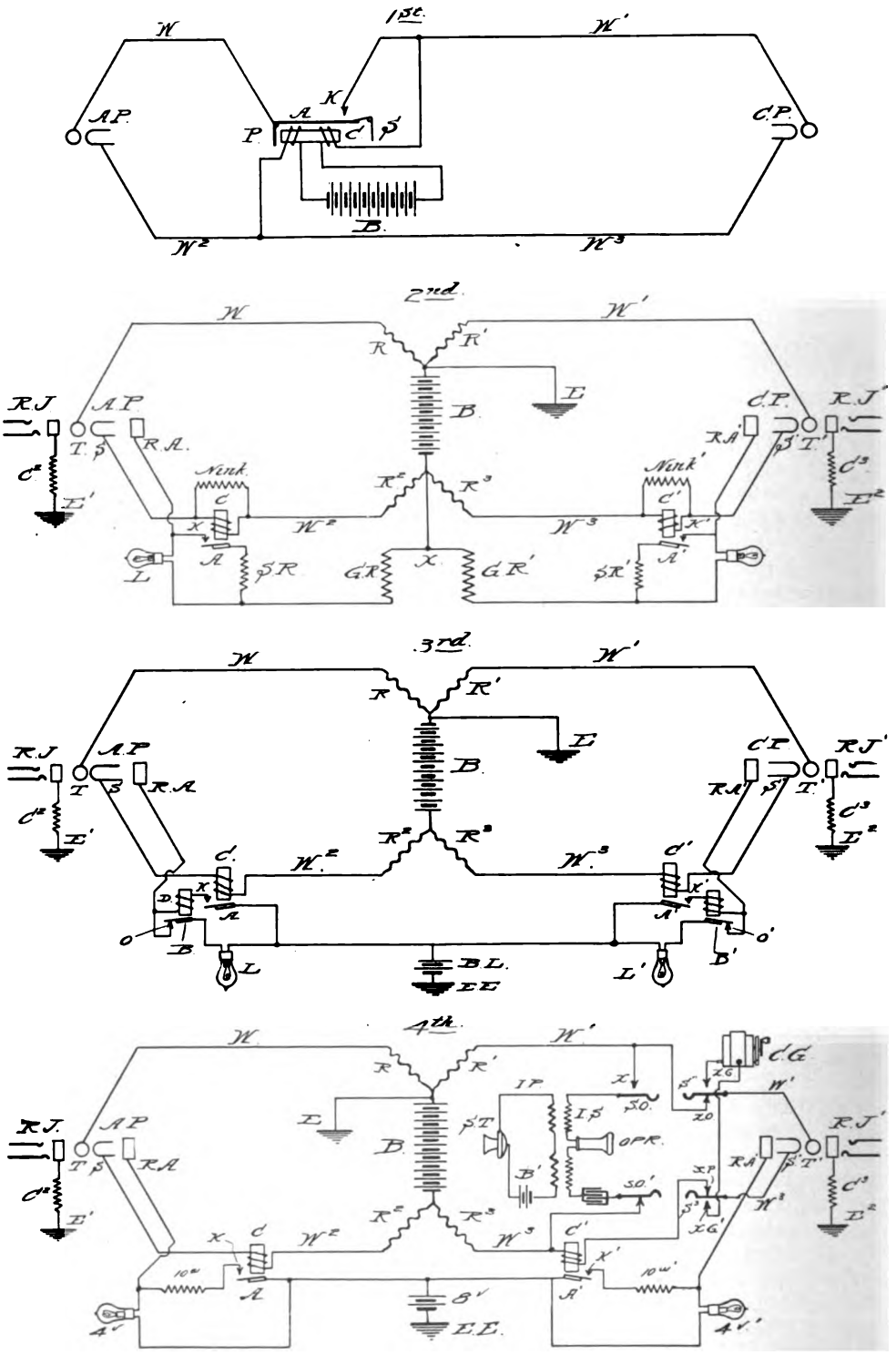

FIG. 11.

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phone subscribers' lines terminating in a single switchboard system. In discussing the problem, the writer will use data obtained from a personal inspection of systems in actual operation.

Fig. 12 shows a 100-line section of a magneto-call type switchboard. This switchboard section as shown is equipped with the necessary trunking appliances for permitting additional sections being added for extending an exchange to one thousand lines capacity.

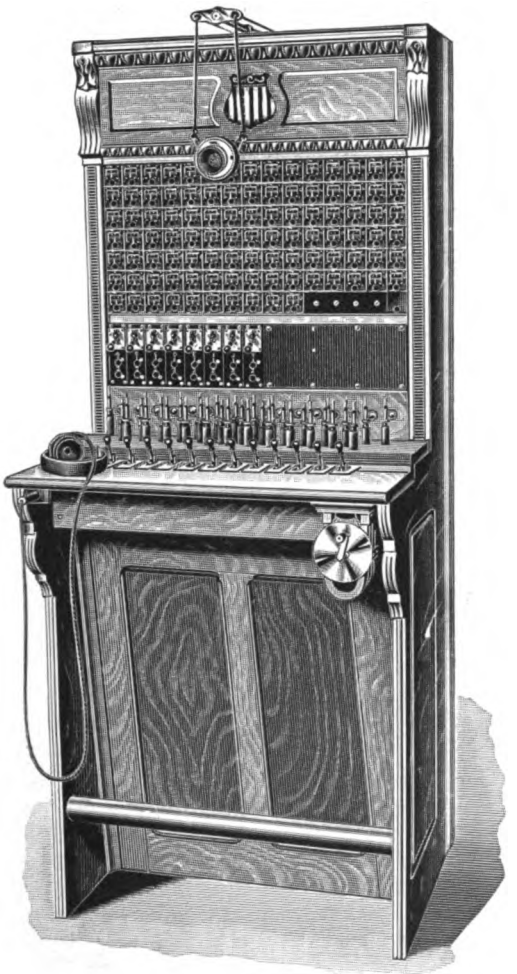

FIG. 12.

This number, however, does not represent the limit to which the trunking equipment may be extended, as that would mean merely an increase in the number of order keys and transfer jacks. Upon examining the figure, it will be observed that the line signal drops are located in the upper portion of the cabinet. Immediately below the drops we have the eight sets of trunking equipments, and below this the required number of trunking plugs and their accompanying signal lamps. The key table, of course, is equipped with the necessary operator's listening keys and twelve sets of interconnecting plugs. The above type of board is commonly called a self-restoring, automatic-ringing express.

Fig. 13 gives us a view of the combined line drop and spring jack. The

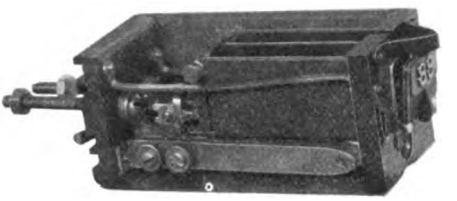

FIG. 13.

construction of this part of the equipment is of such a character that every subscriber's incoming call signal and switching appliance may be bodily removed from the switchboard without affecting the operation of any of the remaining subscribers' circuits.

Fig. 14 gives us a view of the connecting plug used in operating the switchboard. The operation of the switchboard will be better understood by re-

FIG. 14.

ferring to the diagram of circuits shown by Fig. 15.

Referring to the circuit diagram, it will be observed that the subscriber's station equipment comprises the usual magneto telephone appliances, the call to central being sent in by driving the hand generator which forms a part of the station equipment. At the central office this call is recorded by the drop armature being attracted by an electromagnet, which results in releasing the shutter and permitting its falling down and closing an auxiliary alarm-bell circuit or a modification of the alarm-bell

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equipment in the form of an electric light pilot signal. When the drop has been released it assumes a horizontal position just above the jack opening. Now, then, upon examining Fig. 14 it will be observed that the connecting plug is provided with a collar so disposed and of such a shape as to cause it to engage with a projection upon the drop shutter, this engagement resulting in lifting the shutter to its normal position whenever the plug is inserted clear into the spring jack.

Assuming, however, that a subscriber has called in, let us learn what takes place when the operator responds. The moment the incoming call is observed by the operator, she picks up an answering plug, and while placing it into the spring-jack setting immediately below the fallen shutter, causes the latter to be restored into its normal position. At the same time it results in establishing a different character of circuits in the spring jacks. Referring to the spring jack J 1, it will be observed that S L represents the sleeve side of the subscriber's circuit, while the remaining wire of the subscriber's line connects to the line drop L S 1 and the spring L S with its projection X O. This spring, however, normally standing open, the signal circuit being completed thru the line drop to the spring T S, which rests upon the sleeve contact S L.

It might further be explained that the operators' interconnecting plugs have different length plug tips, the calling plug tip being of such a length as to permit its reaching the X O projection of the L S spring in addition to lying in contact with the T S spring. Thus when a calling plug is placed into the line jack, it results in short-circuiting the line signal 1, by virtue of its being connected to the L S and T S spring, these springs being short-circuited by the long tip. In addition to short-circuiting the springs mentioned, the placing of the plug into the line jack results in lifting the T S spring away from the contact with the S L sleeve. After thus responding to a call, the operator would manipulate her listening key and thus connect her operator's circuit to the caller's line.

In case that a request for connection is received which does not require its being extended to another switchboard, the operator would have picked up the calling plug and placed into the called-for subscriber's line jack. Now, remembering that the calling plug is constructed similar to the answering

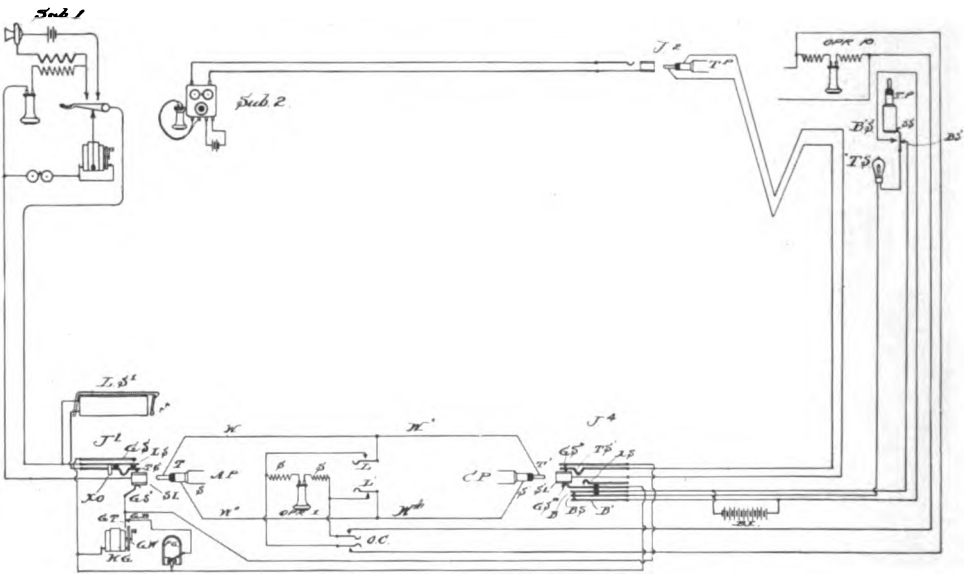

FIG. 15.

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plug, with the only exception of a larger tip, it is apparent that the same combination of circuits would be established in the line jack, with the only difference that the line signal is short-circuited, for the long tip makes contact with the T S spring and reaches into the jack far enough to permit it to come into touch with the X O projection of the L S spring, which fact, it will be observed, results in leaving the line signal cut out of the talking circuit while the caller's line signal is left in a position for permitting it to serve as a clearing-out signal.

However, before we proceed any further, let us learn what operations are necessary for signaling the required subscriber. Upon examining the connection plug, it will be observed that the collar before referred to is loosely mounted upon the plug and held in its most forward position by a spiral spring, which permits of sliding the collar clear back against the sleeve of the plug. Then referring to the spring jack, it will be noted that the spring G S connects to the generator H G and P G, while the spring G S′ connects to the G T spring, which then lies against the G B spring connecting to the power generator. Now, when an operator desires to call a subscriber, the plug is placed into the line jack and pressed far into it against the resistance of the spring mounted behind the collar of the plug. Upon pressing the plug far into the jack, a projection of the T S spring rides upon the surface of a rubber collar, shown on the plug. This raises the spring, together with the L S spring, the latter making contact with the G S generator or spring. Now, referring to the G S′ spring, it should be understood that this spring normally rests upon the insulated collar of the connecting plug, and that when this connecting plug is pressed into the jack, the generator spring slides over on to the sleeve side of the plug and causes the establishment of a circuit with the S L sleeve circuit of the called-for subscriber. It must be remembered, however, that the tip side of the calling plug does not make contact with any portion of the spring jack while the projection of the P S spring lies upon the insulated collar of the plug. After an operator has projected a signaling current over the circuit for a sufficient length of time, the plug is released and automatically restored to its talking position. After the interconnected subscribers have completed their conversation, their desire for a discontinuance of the connection is signified by the usual ring-off signal, but as was explained before, this is not obtained by a separate signal in the cord circuit, as is the usual practice, but by the line signal of the calling subscriber, which was left in the circuit for that purpose. However, upon the operator's perceiving that the shutter of a drop belonging to one of the interconnected subscribers has fallen, she would remove the plugs from the line jack. This removing of plug results in the answering plug restoring the shutter to its normal position by virtue of the relative positions held by the shutter and the collar of the answering plug. In other words, the shutter of the drop is restored to its normal position when either the plug is placed into the jack or removed from the jack, and a transition of the plug from the jack or into the jack always results in placing the shutter into its no-call position.

This much for the operations which are required to be performed when a called-for subscriber is being connected together with a calling subscriber when both are within direct reach of one operator. In the event, however, of the called-for subscriber being located at a distant section of the switchboard, the operator would have been required to extend the connecting circuit to an operator placed before the required subscriber's section. This, as was explained before, is done by a system of order keys, transfer jacks and electric-light signals. Referring to Fig. 15, C P represents the calling plug of an interconnecting equipment, while J 4 represents a transfer jack terminating in the transfer plug T P, O C representing an order key connecting to the operator's set O P R 10. Before proceeding with a description of the operation, let us study the connections of the transfer circuit. The transfer plug T P has its tip and sleeve connection to the S L′ and

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T S′ springs, the generator circuit terminating in the G S″ and G S‴ springs. The springs B and B′ connect to the battery B X and the contacts B S′ and B′ S at the T P transfer plug socket, the B S spring connecting to the T S lamp and S S spring at the transfer plug socket, this spring serving as a selector both at the transfer jack and transfer plug socket. The X S spring in the transfer jack serves to cause the selector spring B S to break contact with the spring B and make contact with the spring B′ whether a plug be inserted or withdrawn from the transfer jack. At T P the spring S S normally rests in contact with the B S′ point, but whenever the T P plug is removed from the socket, the S S spring breaks contact with B S′ and makes contact with B′ S.

It will further be observed that in its normal condition the B S spring makes contact with the B spring connecting to the B X battery, and further that the S S spring normally makes contact with the same side of the battery through the B S′ contact point. It is obvious, therefore, that when a plug is placed into the transfer jack it results in a flow of current through the T S signal, and again, when the transfer plug is removed from the socket during the time that the transfer jack is occupied by a plug, the lamp T S ceases to burn by reason of the S S spring having again selected the same side of the battery as the B S spring of the transfer jack. In order to have this clearly in mind, the reader should trace out the circuits and imagine the different combinations, noting the results obtained. However, subscriber No. 1, calling in, is responded to by the operator, and upon it being learned that a connection is desired with subscriber No. 1000, the operator selects a vacant transfer circuit terminating at the board from which the No. 1000 line jack can be reached directly by an operator, and places the calling plug into the jack. This results in lighting the lamp P S placed alongside of the transfer plug. At the same time the operator presses the O C order key and speaks to the operator having control over the T P plug above referred to and gives the order for a connection with subscriber No. 1000. The No. 10 operator, upon receiving this order, immediately picks up the transfer plug alongside of which the lighted lamp is located and upon lifting the plug from the socket causes the lamp to be extinguished, and while placing the plug into the line jack No. 1000 she gives the first ring, as was explained before, by pressing the plug far into the jack.

After this operation is performed, the answering operator has complete control over the interconnection, and upon her receiving the clearing signal she would remove both answering and calling plugs from the spring jacks, the removing of the answering plug restoring the clearing-out signal, while the removing of the calling plug results in lighting the T S lamp located at the No. 10 operator's position. This operator, upon observing the lighted lamp, immediately withdraws the transfer plug from the No. 1000 line jack and upon reseating the plug into its socket causes the T S lamp to extinguish and thus restore all conditions to normal.

(To be continued.)

LEGISLATION LEGISLATES IN WISCONSIN.

The legislature is "up against" the anti-pass law on the question of telephones for the use of the members. Two years ago the telephones were, "like salvation," free. Any senator or member could talk to his wife or his office, at home, whenever he chose, without money and without price. Now the telephone company has put in a toll telephone and the legislator looks coldly and unhappily at the slots marked "5 cents," "10 cents," "25 cents," "50 cents," and "$1," and at the directions that caution him to deposit the proper change in the proper slot. But the clerks insist that nothing can be done to help the legislators out unless they pass a law to cover the case. Some of the statesmen are getting wroth and one senator has threatened to introduce a resolution to take all the telephones out of the State offices unless relief is given the legislature in this matter. Thus it rests at present.

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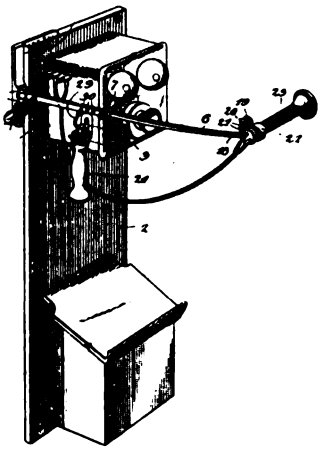
PATENT SIMILARITY.

On January 1, 1901, George W. Ganoe, of Philipsburg, Pennsylvania, received his patent, No. 664,941, with the following essential claim allowed:

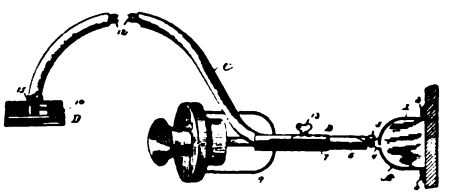
"In a telephone attachment, the combination with the transmitter, of a



switch arm and means for normally holding the arm down, of a laterally movable receiver-supporting arm pivotally mounted adjacent to the rear of the transmitter at the side, and a direct connection from the arm to the switch arm so arranged that the outward movement of the supporting arm will raise the switch arm, substantially as described."

On January 8, 1901, David Laing and George M. Ferry, of Duquesne, Pennsylvania, were granted patent No. 665,788, covered by the following essential claim:

"The combination with a telescoping arm and socket, a sleeve extending parallel with said socket and a yoke projecting forwardly from the sleeve for



attachment to a transmitter, of a receiver support adjustably secured in said sleeve whereby it may be adjusted endwise or axially, the sides of the yoke serving to hold the support in either of its positions."

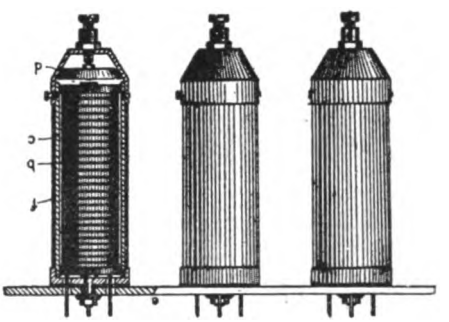
It is readily seen that the two devices are practically alike, the only difference being that Mr. Ganoe describes the use of the switch hook.

These are the kind of patents that create the impression that none are valid until contested and sustained.

A NEW PATENT ON AN OLD PRINCIPLE.

The principle of surrounding a magnetic area with a non-magnetic shield is not a new one. In many telephone switchboards the drop-coils are surrounded with a shell of iron, copper, aluminum and other metals, all for the purpose of preventing inductive disturbances which cause cross-talk in the switchboard.

The novelty of the invention herewith illustrated (patent No. 665,923), lies in the fact that Mr. McBerty has completely encased the coil with a magnetic shield, the customary practice being to surround the coil with a magnetic shield, leaving the ends exposed, which does



not completely eradicate cross-talk. By the use of an iron shield which is divided or split, the magnetic circuit is completed. This in turn is entirely encased in a shell of copper, thereby suppressing alternating or undulating induction.

TO REMOVE DRY PAINT.

Turpentine and linseed oil, equal parts, mixed with pumice stone, makes an effectual paste for removing dried paint from glass. The surplus paint should first be scraped off.

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TELEPHONE CASE DECIDED.

The Appellate Court, at Indianapolis, Indiana, reversed a judgment and sets forth a telephone company's rights and duties.

Under the statute providing that a telephone company within this State which refuses to furnish telephone facilities to any person within the territory occupied by it upon the same terms imposed upon other subscribers shall be liable to the party aggrieved in a penalty of $100 for each offense, a company may be held liable for successive refusals to comply with repeated demands for telephone connection by the same person. But the fact that other subscribers are delinquent, or that the company is indebted to a subscriber is no excuse for his failure to pay his telephone rent when it becomes due.

The Appellate Court so decided in the case of the Rushville Coöperative Telephone Company *versus* Arthur B. Irvin.

The company disconnected Irvin's telephone for alleged non-payment of rent. He demanded to be connected again, and brought suit for the statutory penalty. Afterward he took to calling up the office of the company every day and demanding a telephone, and after being refused nine times he brought a second suit for $900, which was consolidated with the first. He recovered judgment for $1,000, and the company appealed.

In holding that the complaints did not show a multiplicity of suits for a single offense, Judge Robinson, speaking for the court, said that it was the refusal to furnish plaintiff with telephone service and not the disconnection of the telephone he did have, for which the statute gave a penalty, and of which the plaintiff was complaining.

He said that from this holding it does not necessarily follow that plaintiff could have made a demand every minute in the day and maintained an action for each refusal. But there was nothing, he said, to show that the demands for service in this case were not made in good faith, and it was not necessary to say what the rule would be if it appeared that the demands were not so made.

The judgment was reversed on other grounds, however. It appeared that Irvin was indebted for a month's rent, and that when called on for payment he refused to pay, except by giving credit on an account that the company owed him. This account he had purchased from a client who left it with him for collection. He took the position, first, that the company had no right to cut him off, unless it also disconnected all its other delinquent subscribers, because it was bound to treat all customers alike; and, second, that his offer to give credit on his account against the company was a sufficient tender of payment.

But Judge Robinson said that delinquent subscribers who have not refused to pay are not in the same situation as a subscriber of whom payment has been demanded and who has refused payment, and the latter is not entitled to the same favor that may be granted the former.

As to the second point, he said that a telephone company can not be required to stop and adjudicate claims against it when collecting rental.

The law compels it to furnish service, while a patron may take service or not, as he chooses. It must furnish efficient service to all alike who are alike situated, and to do this it must have prompt payment of its dues. It may therefore require payment three months in advance, and use the summary remedy of denying service for non-payment, regardless of the fact that the subscriber claims the company is indebted to him.

WAUSAU, WISCONSIN, EXCHANGE PORFITABLE.

The report of the directors of the Wausau Telephone Company shows that the value of the plant is $19,500. The total amount of stock sold is $7,800, leaving $11,700 that has been paid out of the earnings of the company. During the year eighteen per cent, or $1,130, was paid stockholders for dividends, making the cash dividends in five years sixty-eight per cent. This earning was exclusive of the large sum used in extending and improving the plant. The company is in a very flourishing condition and now has 454 telephones in use.

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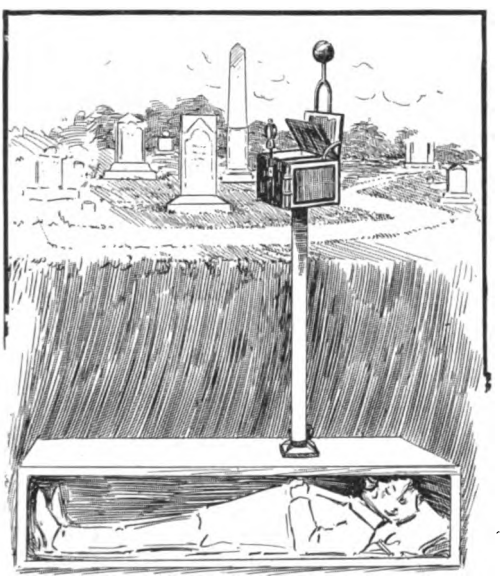
A GRAVE SUBJECT.

Emile Camis, who has been buried alive, has just come to this country, and is willing to be buried alive again. He says there is nothing dangerous in the experience and wants to introduce the Karnice method of life preservation in cases of premature burial. To show his faith in the invention of his friend, he is anxious to be put in a coffin and lowered into a grave. Then he wants the clods to be piled in on top of the casket, his appliance put in place, and a thoro test of the efficacy of the invention made.

In France ten thousand persons have asked that the Karnice apparatus be put over their graves when they die. With it in place it is absolutely impossible,



THE KARNICE METHOD.

according to M. Camis, for a person to die because he has been buried alive.

The method has been tried with success in France. It was operated when it was in the formative stage, and now that it has been perfected its advocates assert that no one should be buried without it.

An ordinary coffin is used. In that part of the lid just over the chest of the occupant a hole is cut and on the chest a ball is placed. This is connected with a rod that goes up thru a shaft to a box above the ground in which burns a light and to which is affixed a bell.

There is also placed directly over the mouth of the person buried a telephone transmitter. At the first sign of returning life the chest stirs, and the ball, acting upward thru the rod, gives the signal in the outer air. At night it discharges a rocket and the bell rings continuously. A similar bell connected to the sexton's office also rings, or a number of bells on any telephone circuit may be connected.

At the first warning, any perceptible breathing or even the slightest movement not heard by the ear would be so amplified thru the transmitter as to be clearly distinguished by the person who may either go to the box over the grave and lift the receiver or go to any one of the 'phones connected with the device.

While accomplishing this, the transmitter also closes an electric circuit which opens a valve, admitting air and also opening up a small retainer holding a quantity of oxygen, which is a wonderful restorative.

Enough air is stored in the shaft so that the person in the coffin could live two days upon it. When the time during which it is possible that he could come out of a trance elapses, the appliance can be removed easily and the grave will look like any grave over which there has been no Karnice apparatus.

M. Camis is a friend of Count Karnice, who invented the appliance. He has helped him perfect some of the details and he has come to the United States to do what he can toward introducing it here. He thinks that in time the Karnice method will be made a part of the knowledge of every undertaker, who will carry his apparatus in stock. The materials in it are inexpensive. The whole outfit would cost hardly more than $40, and M. Camis thinks there will be no difficulty in putting the article on the market.

At the Turin Exposition a year ago he consented to be buried alive to show that the invention of his friend was all he claimed for it, and at the end of two hours he was liberated from his narrow prison. He says he could have remained

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underground for two days if necessary, and that if proper facilities for making a test are accorded him here he will let himself be buried again and have the Karnice appliance put over his grave.

Through it he can signal to watchers above. He says there is not the slightest danger in the feat he is willing to attempt, and he scoffs at the notion that extraordinary courage is required in him to try it.

THE BELL COMPANY SUED FOR $50,000,000.

The Bell Telephone Company was made defendant in a $50,000,000 damage suit instituted in the United States Circuit Court at Chicago by the Atlantic Telephone Company.

The complainant company, incorporated in 1892 with a capitalization of $5,000,000, never engaged in business or put up instruments. In the suit filed, the company alleges that it acquired certain patent rights from Henry C. Strong, an electrician, who lives at 739 North Rockwell street.

The claim made in the action filed, is that the defendant company is operating under patents which conflict with those granted Strong, thereby depriving the plaintiff of a large profit.

Besides the Bell Company, there are named as codefendants the American Telephone & Telegraph Company, the Chicago Telephone Company, and the Central Union Telephone Company. These are brought into the litigation as licensees of the principal defendant, and if the restraining orders asked for in the bill are granted they will extend to all other concerns which may be using the same patent by agreement with the Bell Company.

It is set forth in the preface of the bill that Henry C. Strong was the inventor and originator of " a new combined telegraph relay and telephone mechanism to be used in connection with the transmission of signals or words between different points." The letters patent were numbered 312,670, and were issued to Mr. Strong on February 24, 1885. Part interest in the patent was assigned about that time to D. A. Strong and H. P. Caldwell.

In August, 1892, the complainant company was formed, with Mr. Strong as one of the stockholders, and the patent rights were sold to the members of the corporation. The Bell patent is said to date back to 1877, but it is urged by the complainant that no patent on this device was ever issued to that corporation.

In litigation during the last few years between the Bell Company and other concerns, the claims of the Bell Company were sustained, it is claimed, because of the priority of interest shown by that corporation. On the other hand, Mr. Strong says he applied for his patent in 1876, but, he alleges, the model which he then submitted was stolen and his application was held up until 1885, when a new model was presented.

The patent rights under the letters issued in 1885 will expire in less than two years.

Attorney Ossian Cameron, for the plaintiff, says he will ask an order restraining the defendant companies from operating any longer under the patents claimed by his client.

FREE SERVICE DOES NOT WIN.

Huntington, West Virginia, is one of the few cities where telephone service is had absolutely free of charge. In that town the Bell and a home company are fighting tooth and nail, and three years ago the Bell created a sensation by announcing that until further notice its service would be given free.

This was expected to crush the home company; but, contrary to expectations, it has thrived; its rates have not been cut and the number of 'phones has increased. Of course, there has been an active demand for the free Bell 'phones, but the company is slow in complying with requests for the installation of instruments.

Aside from its free service the Bell gives a wider service, but the fact that the home company is owned largely by local persons has given it a foothold which it is destined to maintain. New Philadelphia, Ohio, near Wheeling, is another town where the Bell gives an absolutely free service, owing to competition with the home company.

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ERIE SALE HELPS INDEPENDENTS.

In speaking of the Independent telephone situation, Judge J. M. Thomas, president of the Independent Telephone Association of the United States, said the movement was never in better condition.

He openly declared that the recent sale of the Erie Telephone & Telegraph Company to the Bell interests was an incalculable benefit to the Independent companies, and explained that its control by the large national Independent Company was a menace and a drawback to the harmonious relations of the Telephone, Telegraph & Cable Company of America with the numerous telephone systems thruout the country, which are now being operated in opposition to the American Bell.

"The Independent telephone men," he said, " are now working East, and it will not be many months before a trunk line connection is made with the Knickerbocker Telephone Company, of New York city. The Independents have now a line connection from an Ohio company, which if extended forty miles in New Jersey, will give us a connection with Jersey City, where there is an Independent telephone exchange.

" The Independent telephone situation was never better. Its prospects were never so bright, and the growth during the past few years has been something more than phenomenal. A great drawback in the movement up to the present has been the fact that we are not represented in New York, Boston and Philadelphia, with which connection could be made with Western companies.

" It is essential that a trunk or long-distance system should have connection with New York, Boston and Philadelphia. These are the business centers of the nation, and to a national telephone system they are as necessary as the heart is to the human body. The East, which usually takes up and perfects an idea first, has been backward in the telephone movement, but it will not be long before the situation is improved.

" Ohio has undoubtedly the best developed telephone system of any State, altho Michigan, Indiana, Illinois, Pennsylvania, Iowa and Wisconsin have unusually well-developed systems. In Cleveland three years ago there were about four thousand telephones in operation, while now there are twenty thousand in use.

" In Columbus there were 1,750 'phones, and after an Independent system was put in operation the subscribers number 7,300. Of course, both the Bell and the Independent companies increased the number of subscribers as a result of the activity of solicitors, so that the increase is not wholly the property of the Independent companies. The users find that the instruments are as necessary as a stove, and would as soon think of removing that as they would a telephone.

" In Ohio there are sixty-two thousand Independent telephones and forty-three thousand Bell instruments. In Detroit, where the Erie Telephone & Telegraph Company absorbed an Independent system, a new company is being formed which, I understand, has secured a franchise from the municipality to provide an Independent exchange. Similar exchanges are being constructed in a great many towns and cities thruout the West.

" There has been a great deal of suspicion attached to the operations of the Telegraph, Telephone & Cable Company. The fact that it absorbed the Erie Company aroused a considerable antagonistic feeling toward that company on the part of the Independent systems, with the result that not a few refused to consider a merger scheme. I believe, too, some of the Independent companies thought they were not approached in a proper way when the matter of the purchase funds came up for settlement. The Telegraph, Telephone & Cable Company, it is said, spent its surplus cash in the purchase of the Erie. When it attempted to buy out small operating companies, it was felt by them that there was nothing substantial to the offer. It was also felt by quite a number of companies that no matter how sincere the Telegraph, Telephone & Cable Company might be in its effort to become an Independent national system, its management was not starting out properly by

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buying a Bell property and using up the cash which might have otherwise been applied in developing the metropolitan district.

"Everybody, one might say, expected this would be done, and to some extent it was carried out by the Knickerbocker Telephone & Telegraph Company, but not as fully as what it might have done.

"Naturally distrust grew up and but little progress was made where the efforts of the Telephone, Telegraph & Cable Company combined with those of the Independent system in operation thruout the country might have accomplished a great deal. Charges and countercharges were made, but I am happy to say all this has ended. With the sale of the Erie Company the atmosphere has been greatly cleared, and I am confident that great strides will be made from now on."

AN IMPORTANT VICTORY.

Now that the expected and inevitable result has been reached in the suit brought by the Central Union Telephone Company against the Bryan Telephone Company, I. E. Gardner and Will W. Morrison, to recover $10,000 damages, it may be of interest to refer briefly to the local company, the causes that led up to its organization and its history up to the present time.

About seven or eight years ago the Bell, Central Union Company, built a telephone exchange in Bryan. They started in with sixty-five or seventy subscribers, which was as large a number as they ever had up to the time the Bryan or home company was started. The rates were so high that most people were prohibited from having a 'phone at all, being $24 a year for a residence and $36 a year for a business telephone. The result was that the exchange remained so small that it was of but little value to the few who did subscribe for 'phones. In the fall of 1898 the attention of some of our business men was called to the lower rates that existed at surrounding towns, such as Defiance, Napoleon and Wauseon, where exchanges had been built and maintained by the residents of the various places. A company was organized and incorporated, subscribers were solicited and by the terms of the contract 140 were guaranteed, which was double the number the Bell exchange had. The franchise granted to the company limited the rental price to be charged to subscribers to $12 a year for residence telephones and $24 a year for business telephones. At the same time the contracts guaranteed that all subscribers in Bryan were to have individual metallic service and that there would be no party lines. The Central Union Telephone Company was furnishing a party-line service at a reduced price, $18 per year for residences, and most of the 'phones were on the party-line system, with a result that has been happily described as "four in a bed."

The system was very unsatisfactory, as any subscriber on either line could listen to your conversation, and when the business men of Bryan were approached with a proposition from the new company they gladly subscribed, most of them for a term of five years, for they welcomed a change which they felt could not but be for the better. Then began a fight for business. The old company pursued the same methods that they use, so we are informed, wherever a home or opposition company is organized. The parties who had obtained the franchise from the town were seen by the representatives of the Bell Company, and were given to understand that they could name their own price if they would agree to turn over the franchise and promise to keep out of the telephone business. Reports were circulated to the effect that no company but the Bell licensees knew how to build a telephone exchange, that the company here was being organized for the purpose of selling out, and for no other; that no exchange would ever be built. When the poles arrived and were being erected, it was asserted that no wire would be placed on them. Parties who had given contracts to the home company were told that the company would not be able to get the telegraph office or the railroads. Some were persuaded to cancel contracts that had been given to the home company on

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the grounds that they had been obtained by misrepresentation, as the railroads were not going to take the new service. All this was before the Bryan Company had opened its exchange. It continued calmly on its way, however, erecting poles, placing wire thereon, equipping its exchange, and finally opened with about 175 'phones in service. The method of misrepresentation which had been in use reacted on those who had used it, for when the people saw that the home company was doing all it had promised, they turned to its support with a hearty good will. Those who had canceled their contracts came to it later. The company has grown constantly until now it has about three hundred and fifty subscribers. In the recent case at Toledo it was elicited from the manager of the Central Union Company that the largest number of subscribers they ever had in Bryan was 192. They have, at the present time, about one hundred less than that number.

As soon as the Bryan Company opened its exchange, the Bell Company adopted its "fighting rates" of 50 cents a month for residence telephone, which rate, it was stated, was to be maintained until the new company was driven out of business, when the 50-cent rate would be abandoned. It is needless to state that this rate is in use, and will undoubtedly remain so for some time. It is understood that 50 cents is the amount paid by the Central Union Company to the American Bell Telephone Company, "Milk street, Boston," for the use of the Bell instrument. If this is the case, some of the telephones in this town in the Central Union exchange are furnished at the actual cost to that company and maintained at a loss. From the same premises it would seem that the company is operating this exchange with the profit derived from its exchanges in larger cities and in towns where no competition has been experienced.

While there have been times when the service of the Bryan Telephone Company has been faulty, it has been generally satisfactory since its inception, and deserves the support which has been accorded to it by the Bryan citizens. It is a home enterprise, managed by home people, there being no less than twenty-two residents of Bryan numbered among its stockholders. Many farmers are now connected with its exchange, which is of great value to town subscribers. As a result of this fact, and the superior service, together with the larger number of subscribers, a movement was started last summer, among the meat men first and among the merchants in other lines of business later, to do away with two telephones and adopt the Bryan telephone to the exclusion of the Bell. When this became known, the Bell Company sent two solicitors here to try to knock out what they termed as "combinations" against it. There was considerable energy developed by the representatives of both companies, with the result that the meat men, druggists, icemen, hardwares, liverymen, doctors, county courthouse, jail, and part of the grocerymen have discontinued the use of the Bell 'phones. They did this by sending printed notices of discontinuance to the manager of the exchange through the medium of the representatives of the Bryan Company.

Since the organization of this latter company it has been difficult to get the Bell Company to remove 'phones when ordered discontinued, and so to insure the removal of the 'phones, the various subscribers who wished them removed authorized the representatives of the Bryan Company to take them from the wall and thus see that the service and, incidentally, the rent was stopped; for a clause in the Bell contract provides for its renewing itself at the end of each quarter, unless terminated by previous written notice, and when the 'phone is left on the wall it usually has to be paid for. These notices were served June 30, 1900, and in the removal of the 'phones great care was exercised that no damage was done. They were placed on the floor and left until the Central Union agents finally took them to the exchange some five weeks later. On July 13 a suit was brought by the Central Union Company in the United States Court at Toledo, asking

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damages in the amount of $10,000, alleged to have been suffered by reason of the Bryan Company having induced its subscribers to discontinue the service by "threats, intimidation, force and misrepresentation."

At the time the alleged injury was suffered the Bryan Telephone Company's agent served twenty-one notices to discontinue the Bell 'phones. These twenty-one persons were subpœnæd by the defense, who were ready to prove by them that they had not been induced by the Bryan Company or its agents thru "threats, intimidation, force or misrepresentation," to discontinue the service of the Bell Company. Only two of them were given any opportunity to testify and these were called by the prosecution, as, at the time it rested its case, the judge proceeded to charge the jury to bring in a verdict for the defendant, no case having been made.

This trial has attracted national attention, as it was regarded as a test case, and the result has been eagerly awaited, for the condition that existed in Bryan is duplicated in hundreds of towns today. Had the Bell Company won, it would have meant that this once great monopoly was again to have the field without hindrance, that the old prices would prevail and telephones would again be restricted to the few. But with the result as chronicled above, Independent telephone investors will have renewed confidence that they are not going to be interfered with by the former monopoly. There are many local investors in Independent telephone securities in this vicinity, and as a class such securities are highly regarded. The result of the trial will be of more than local interest to such investors, as it is easy to see the wide import of the decision.

IOWA COMPANIES CONSOLIDATE.

Nine Independent telephone lines, controlled by the Central Telephone Company, the Hawkeye Telephone Company, the Boone Telephone Company, the Indianola Telephone Company and Clearеld-Mount Ayr Telephone Company are now operating under one management.

FAMOUS ZANESVILLE CASE.

The Supreme Court of Ohio has made public its syllabus in the case of the City of Zanesville *versus* The Zanesville Telephone & Telegraph Company, involving the question of the right of appeal to probate courts from the decision of municipal authorities in cases in which corporations seek to secure rights on the streets of a city. The court originally held the law granting such right unconstitutional, but the decision was reversed on Tuesday. The most important paragraphs of the syllabus, which is very long, are as follows:

The fact that a power is conferred by statute on a court of justice, to be exercised by it in the first instance in a proceeding instituted therein, is itself of controlling importance as fixing the judicial character of the power, and is decisive in that respect, unless it is fairly certain that the power belongs exclusively to the legislative or executive department.

The power to make such order, as provided in Section 3461, is not inappropriately conferred on the probate court; and that court has complete jurisdiction of a proceeding instituted therein in conformity with that section. The provision is not obnoxious to the constitution of the State on the ground that the power it confers is distinctively legislative or administrative, but is constitutional and valid.

Judge Williams wrote the opinion and Judges Burket, Spear and Davis concur.

Attorney S. M. Winn, representing the Zanesville Telephone & Telegraph Company, has filed application in probate court of this county, asking Probate Judge Andrews to designate the manner in which the company may use the thorofares of the city.

This is the second time that Mr. Winn has asked the court to take this step. The first time was two years ago, when Judge Ford ruled that the statute under which the application was made was unconstitutional.

Judge Andrews is preparing an outline of the manner in which the petitioning company may use the city's thorofares.

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Published on the 1st day of each month.

ELECTRICAL ENGINEERING PUBLISHING CO.

JOHN C. McMYNN, PRESIDENT.

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Legislation for Telephone Taxation.

The legislatures of many States are proposing special telephone tax enactments on the same basis as that of railroad valuations. It is coming, and we might as well face the music.

It is no argument against taxing telephones on value that we tax railroads on gross receipts. On the contrary, if we can bring the railroad tax nearer to the value-basis of assessment than that now in vogue, uniformity will be promoted. The valuation of telephone company property includes position or good-will — that is, franchise. In a certain sense every piece of property in private hands is assessed today on a value, in which location and good-will figure. This good-will is a social value which embodies the essential elements of franchise valuation.

Louisville, Kentucky, placed a valuation of $10,000 on a telephone franchise. Is it not the wisest course to anticipate taxation and prevent injustice by using all available means to secure a fair valuation of telephone properties?

The finest exchange is of little value in the Desert of Sahara. All taxation tends to be distributed among consumers, and the tax problem is to equalize this distribution. Taxes are part of the cost of doing business, just as are labor, interest account, repairs, insurance. There is the same tendency to distribute the cost among consumers that there is to charge off the cost of all fixed expenditures against the consumer. If a concern is taxed $100, that tax is a $100 charge on the expense account side of the business involved, and the products of the business must pay this charge in common with other charges. If we tax one industry on one basis, there is danger of inequality not only if we tax a competing industry on another basis, but if we tax industries in general on a basis of value, and great enterprises in particular on income. If telephone companies, which are in a sense monopoly, are fairly taxed, they should not use a higher tax as an apology for raising their charges, but as an incentive to get into the game for more business.

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A New Sky Piece. When it was first announced that Professor Pupin received $200,000 in cash and $7,500 annuity for his long-distance circuit patents it looked reasonable or otherwise, depending on whether the lookee was going up or down the financial ladder. Next, the daily press had an average announcement of the amount as $500,000. In two days it reached $750,000. The country papers now spread their announcement at $1,000,000, with a suburban residence, yacht and an automobilly as incidental perquisites to a wonderful invention, and call upon their youthful constituency to subscribe and aspire. This is not always the fortune of inventors and we send to Professor Pupin, over his own long-distance circuit, our congratulations, in the hope they will eventually reach his dizzy perch.

Wireless Imagination. Wireless telephony is wonderful in itself without the flights of imagination with which it is pictured in the daily press. Authentic data are scarce, but imagination gives to the literary bird burnished wings for its daily flight. Cases are not wanting where an imagination which has received a scientific training has made curious approximations to future discoveries and occasionally facilitated them. Even without scientific aid, the imagination of writers has occasionally anticipated discoveries in a general way, but without in the slightest degree facilitating it.

An English paper, called the *Chromolithograph*, in December, 1868, gives a write-up of two American telegraph operators communicating with each other without wires. In the *Spectator*, published in London in 1711, reference is made to a loadstone that when touched with two needles imparted to them such a quality that when one of them moved, the other, however far separated, would move in the same way. Two inventive friends, each of whom had one of these needles, made plates with letters on them and by the motion of the needles communicated with each other thru considerable distances. This experiment certainly anticipated wireless telephony, tho the method is obviously valueless. It was a fiction antedating the truth by nearly three centuries.

An Investment Criticism. We believe the Independent Telephone Association to be a great institution. Our resources are at its command to the limit. We all pull together for success, and our personal interest in that success gives us courage to criticize. It has been the practice of the Independent Telephone Association to include in its "Annual Report" a list of the "Independent Telephone Companies in the United States," and that an effort is made to have the list approximately correct, in view of its probable acceptance by the public as the official list of the association. Thus they are interested in the result of an investigation made by a Philadelphia capitalist, who was contemplating a large investment, the details of which are in substance as follows: Desiring the coöperation of the capitalist, a telephone man stated that there were 3,500 Independent telephone companies, representing an investment of nearly $100,000,000, in the United States. And to substantiate his statement, a copy of the "Report of the Fourth Annual Convention" was attached to his estimates.

Now the capitalist was almost persuaded by the telephone man's clear presentation: but being cautious and conservative, proceeded to verify some

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of the statements by requesting information from a half a dozen companies selected at random from the list. Two of the answers were so surprising and disappointing in character that he proceded to make a thoro investigation, the result of which led the capitalist to conclude that there are less than 3,500 operating Independent telephone companies, and that the total actual investment is nearer $50,000,000 than $100,000,000. Of course his deductions were incorrect because his source of information was likewise. There are over 5,000 Independent exchanges, with over $90,000,000 invested therein, but in the course of his investigation he found that the association had unwittingly included a majority of the Bell licensee companies in its list, and it was from these licensee companies that voluminous replies filled with practical data of a most discouraging character were received. Evidently several of these Bell licensee companies had caught on to the fact that they were classed as Independent telephone companies, were expecting just such inquiries and had their deadly ammunition prepared. For instance, the Association lists under Baltimore, Maryland, the Chesapeake & Potomac Telephone Company, and that company promptly replied to the Philadelphian's enquiry by enclosing a copy of Judge Wilson's reply to the circular prepared by the Washington Telephone Company, while another licensee called attention to an alleged increase in the residence rates in St. Louis of thirty-three per cent.

As the capitalist concluded not to enter the telephone field, the loss to the industry was a severe one in every sense, as his name alone would have been a tower of strength, while his business judgment would have been invaluable. Thus we feel impelled to present to our readers the necessity of urging upon the association the vital importance of revising and correcting its list before the summer meeting is held. And with that end in view, we would suggest the following changes:

First, carefully weed out from its list the following named Bell licensee companies, some of which are entered several times:

Central New York Telephone Company.

Central Pennsylvania Telephone & Supply Company.

Chesapeake & Potomac Telephone Company.

Chicago Telephone Company.

Colorado Telephone Company.

Cumberland Telephone & Telegraph Company.

East Tennessee Telephone Company.

Empire State Telephone Company.

Hudson River Telephone Company.

Miami Telephone Company.

Nebraska Telephone Company.

New York & New Jersey Telephone Company.

New York & Pennsylvania Telephone Company.

Northern New York Telephone Company.

Oregon Telephone Company.

Pennsylvania Telephone Company.

Providence Telephone Company.

Southwestern Telegraph & Telephone Company.

Troy Telephone & Telegraph Company.

Vermont Telephone & Telegraph Company.

Second, enter the name of each operating Independent telephone company opposite the name of the city wherein its general office is located, and place beneath this entry the names of towns in which it is operating exchanges or maintaining pay stations. For instance:

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Boston: Massachusetts Telephone & Telegraph Company.
Exchanges in Abington, Agawam, Auburn, etc.
Pay stations in Brown, Black, etc.

While this plan would reduce the association's list of "companies" in Massachusetts from ninety-four to about twenty, it would be an honest presentation of the situation. A similar plan carried out in California would reduce the number of indicated operating companies from forty-one to eighteen.

Third: Remove the names of many companies that have long since passed out of existence, or have been absorbed by other companies.

Fourth: Enter the name of no company from which a reply is not received.

Naturally this work of revision will entail labor and expense on the association, if it is carefully done. But experience has shown that it can be thorcly done at a cost not to exceed 10 cents per name, or a total cost of $500. We have done part of this work ourselves, but information will be given the association that is not extended as a matter of courtesy to any publication, and we believe the association is in honor bound to correct these glaring blunders, in view of the generous contributions for the expenses of the association made by the principal manufacturers, if for no other reason.

Helps Poor Inventor.

When an inventor files his application for a patent in the United States, the examiner to whom it is referred searches the records of the world to find an anticipation, and throws upon the inventor or his attorney the burden of proof that the invention is new and not anticipated by the references cited. This often involves a loss of time and an expense that the inventor can not stand. When a compromise is reached as between his own idea of what he should have and what the examiner thinks he is entitled to, he usually takes what the examiner grudgingly or graciously gives him, because he is rarely prepared for the delay and expense of an appeal from the examiner to the Board of Examiners, or from the Board to the Commissioner of Patents or from the Commissioner to the Supreme Court.

The Government even in granting his patent does not usually confer a right to the exclusive use of the invention described, because the allowance of the patent is assumed to show that the examiners did not find in the records any anticipation of the invention. Now, as the records are not complete and their judgment not always logical, the validity of the patent is always in doubt until it has been tested by suit and sustained by the court of last resort.

Hence a form of insurance that will protect the needy inventor is a thing to be commended. There is such a form of insurance and we refer to it in an article of this issue, not as an advertisement for any insurance concern but in the hope of helping some of our inventive readers.

Discussion on Telephone Tax in Maine.

The State Committee on taxation gave a hearing on the bill for the taxation of telephone and telegraph companies, and Hon. Clarence Hale spoke for the New England company. He referred to the growth of the business in Maine. The telephone, said Mr. Hale, has become, with the telegraph, one of the great means of communication. It is necessary that this business should be done by companies covering a wide area.

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You can see that the cost of operation in this State is very large. Maine, a State of great distances, I think, does business in every hamlet of five hundred people. It is interesting to see not only the growth of the business, but how much more we use the telephone than formerly. It has been figured out that to every seven calls in a day ten years ago, there are now twenty-seven calls. Now, the growth of the telephone business multiplies geometrically rather than arithmetically. It costs much more than twice as much to operate two thousand telephones as it does to operate one thousand, and this is especially true in Maine, where the lines are long. I had supposed the Legislature would think best not to change the system of taxation, but your bill has in mind to change it to a gross-receipt tax. We are perfectly willing to accommodate ourselves to it, if you think that the best method. Our gross receipts in this State for the past year are $307,332.04. I think that you will agree with me that, while this bill is formulated on the principles applied to railroads, the State would get more income to make a flat tax of a certain amount rather than to base the tax upon the earnings per mile. Now, why? You tax a railroad so much per mile. You can not tax a telephone company on that system. You can not get at any element based on the mile in the telephone business. Continuing, Mr. Hale said that as near as could be determined, the operating expenses of the New England Company in Maine were ninety per cent of the gross receipts. After many years the company had been able to pay a dividend of six per cent with no surplus. It was willing to pay a flat rate of four per cent on the gross earnings, which would increase its tax from between $9,000 and $10,000 to between $12,000 and $13,000, and be equivalent to more than one-quarter of the net earnings in the State.

Mr. Maynard Bird, representing the Eastern Telephone Company, said that it seemed to him that a tax based on the gross receipts was the proper method. Mr. Bird emphasized the importance of the section which provided for ascertaining the exact amount of the gross earnings. He was opposed to the flat rate as suggested by Mr. Hale and believed in a graded rate, in proportion to the earnings. The gross receipts of the Eastern Company are $10,000.

Mr. Lewis A. Goudy appeared before the committee. He told of the history of the telephone service in Maine, and told of the doings of the Dirigo Company. "We have stood out all these years and have not been absorbed," he said. "Since last July we have thrashed out the wheat and chaff and have discovered that we have the best charter, one granting eminent domain, ever issued in the State of Maine. The company represents an investment of about $40,000, and has about five hundred miles of working circuits, with many subscribers. Our charter is so broad and liberal that it is sufficient to do a general competitive business against the Bell Telephone Company. I have been surprised tonight to hear my friends Bird and Hale say that in the telephone business the more business you do the less you get out of it. When I was baking crackers for a living I thought I increased my net income when I baked ten barrels of flour per day compared with when I baked five.

"I know that the farmers of this State pay, as a general thing, double the tax to the State according to valuation than the corporations. I looked over the records and I found that there was a most inexplicable variation in the tax rate. While one company paid a tax on

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its gross valuation, others paid nothing. I found that the New England Telephone & Telegraph paid 2-5 of one per cent on its investment in Maine, while my company paid 2½ per cent, and my friend Bird's company paid nothing.

"I am not a believer in this bill — not for a minute. I believe that the State should impose a franchise tax on telephone companies different than on transportation companies."

Mr. Goudy then quoted statistics to support his statements.

It is not the amount invested that governs the value of an exchange, and a fair taxation is that based on its earning capacity.

Effective Legislation.

In an editorial of the May, 1899, issue, under the title of "A Remedy for Bell Falsehoods," we stated that, in our opinion, "the most radical and most satisfactory remedy that can be applied to prevent the misrepresentations of the motives of the Independent companies was for the local telephone companies to join in an earnest effort to have laws enacted by their respective State legislatures, making it a misdemeanor for the Bell Company to purchase a competing telephone exchange." We suggested that the punishment might include "forfeiture to the State of all the property so purchased, and the State then to sell the property to the highest bidder and convert the amount received therefor to the general fund of the State treasury."

Hence, we are glad to record the introduction in the Pennsylvania Legislature of a bill providing that "no corporation, association, partnership or individual owning, operating or controlling any telephone line or lines shall acquire either by purchase, lease or otherwise, any competing telephone line, or the controlling interest in the stock or bonds of such a line, nor in any way, directly or indirectly, control, operate or own it or the controlling interest in its stock and bonds," under penalty of a forfeiture to the Commonwealth. This bill was introduced by the Hon. George M. Hosack, the Republican representative from the fifth district in Allegheny county, and is already receiving loyal support from Independent companies.

We hope that this bill may speedily become a law; for it is the most effective way to insure the permanency of our local Independent exchanges and remove the sting in the Bell falsehood that "the formation of a local telephone exchange is an unwarrantable attempt to coerce the Bell Company into buying the property at an exorbitant price, in order to shut out destructive competition."

What the Bell interests most seriously fear is not that they may be forced to buy local plants, but that the management of these plants may, while retaining local ownership, enter into a comprehensive system of interconnected toll lines, which will double the value of each exchange and render their position impregnable.

A Point to Ponder.

Following is an extract from a personal letter, written by the president of the Federal Telephone Company to the general manager of an Independent telephone company, that we are willing to commend to our readers as worthy of thoughtful consideration:

After a careful study of the situation as you explain it, there is only one plan to follow. Properly rebuild the old plant, as quickly as possible, and avoid further loss. If your directors prefer to sell to some Independent interests which yield a cash return less than the total investment, yet more than the actual

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outlay on the part of the stockholders, it may prove the better plan, unless the directors are a unit in building as strongly, as completely and as comprehensively as possible. But if your directors will take the broad view of the question and build for 1905 rather than for 1901, will build on a basis of a round thousand subscribers thruout the entire system instead of for only six hundred, will use only standard material of good quality, then you can look for the favorable outcome you anticipated in the beginning. For on every hand we see how conditions are rapidly changing in favor of the man who has built strongly, wisely, and for the future, believing that the best is none too good in the telephone industry. Such men can always command their own price for their up-to-date plants, and they are forming the nucleus for the newer Independent movement that is rapidly absorbing and junking the old and erecting new and better systems than were ever dreamed of by the pioneers of 1893-95. I explained to your directors how the wonderful impetus the Independent movement has gained during the past two years was largely due to the interchange of ideas among these more progressive men, resulting in a concurrent opinion that it was far wiser to buy in the old semi-dead or decaying plants, junk or scrap the equipment, and, if necessary, junk the lines too, and start fresh and clean and up-to-date. It means a heavy outlay to begin with, but the saving in repair and maintenance charges is beyond belief. Moreover, in many cases, it is rebuild — or die. For now that the telephone-using public in the smaller cities has become accustomed to the use of the telephone and understands the nature and value of good service, it demands, and demands in a most tyrannical manner, the highest class of service. And we all know that it is no longer in the power of the old-time exchanges to give high-class service. . .

Whether the Postal and the Western Union amalgamate their interests and are then absorbed by the Bell, and the Bell then takes in all licensee companies, and reorganizes on the plan of divisions and districts, and presents a front so powerful that further contest will appear foolish, or whether existing conditions continue, the incontrovertible fact remains that a properly and strongly built up-to-date telephone property is and always will be a menace of so grave a character to the consolidated interests, that it can always command a price that will yield a fair profit on the total investment, should the public neglect giving merited support. On the other hand, the decaying pioneer plant that has outlived its usefulness is, in any event, allowed to die a natural death.

Thus, again I say, scrap your equipment and rebuild your entire plant, or sell to some Independent company that will. There is no middle course for your directors to follow.

Whatever opinion our readers may hold regarding the sometimes alleged affiliations of the Federal Telephone Company, it must be conceded that no better telephone lines were ever built than the Federal has constructed in the forty-one boroughs that granted franchise rights during the year 1900. And the fact that all of these lines parallel Bell lines could be accepted as a good indication of the comprehensive character of the system, and the important part it may yet play in the Independent field, more especially as it expects to secure fifty franchises this year. Now if Bell money is paying for all these duplicate plants, what a joke the Independents have on the Bell, that it had to adopt Independent methods in order to give the people an admirable high-class telephone service at reasonable rates, and then, as an inducement to the people not to enjoy this perfect service, to reduce its own rates below the Independent rates in order to get the business into the Bell exchange.

"HEREWITH a $1 bill to cover subscription for the year to come. I wouldn't miss your magazine for $100."

H. B. GRAUEL.

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BILLS THAT SHOULD NOT PASS.

A bill introduced into the Wisconsin Assembly by Mr. Rossman, of Ashland, is unjustly sweeping in its provisions. It fixes the rates that may be charged not only for local service, but long-distance messages as well, and provides for connections between rural long-distance companies. The rates are fixed as follows:

In cities of 100,000 inhabitants or over, $4 per month for telephone rental; in cities of 30,000, $3 per month; in cities of 20,000, $2.50; in cities and villages of less than 20,000, $2 per month. The rate of long-distance messages is fixed at 10 cents per minute for each one hundred miles or fraction thereof. All companies are to be compelled to put in switchboards which will enable them to make connections between the different systems. There is to be an extra charge of 5 cents for the connection unless the message going out is over the system of the company owning the switch. Fines for violation of the act are made as follows: For the first offense, from $200 to $500; for the second, from $500 to $1,000; for the third, from $1,000 to $5,000, and for subsequent offenses, $10,000.

Illinois is also blessed with a similar bill, introduced by Mr. Spiegel, fixing telephone charges in cities and villages of 60,000 or more inhabitants at $4 per month; in cities of more than 25,000 and less than 60,000 inhabitants, $2 per month; in cities of less than 25,000 inhabitants, $1 per month. Where two cities or villages are connected by wire, operated or owned by one individual, firm or corporation, the toll rates shall be 10 cents for the first ten minutes and 5 cents for each additional five minutes.

Local conditions vary. Some exchanges with small line mileage have three times the subscribers that may be reached by another exchange having a large line mileage. A fixed rate applied to all alike is an injustice. The rate should be made on the basis of mileage and number of subscribers, and not on population. A proper presentation of the matter to the Assembly committee should stop the enactment of this bill and prevent prospective sandbagging.

AN OPPORTUNITY FOR INVESTMENT.

We think the following letter is entitled to publication:

TRACY CITY, TENN., February 4, 1901.
THE TELEPHONE MAGAZINE, *Chicago, Ill.:*

GENTLEMEN,—We would like to call the attention of practical telephone men of means to the great opportunity of constructing paying trunk lines thruout the State of Tennessee, to connect all the Independent systems.

The Independents cover the greater portion of eastern and middle Tennessee, and what is needed is trunk lines, connecting them with trade centers and with one another. The feeders are here and would keep such trunk lines red hot. Would you kindly call the attention of capital seeking such investment to our State? Your journal has reached our office regularly for the past two years, and we would not miss a copy of it. Success to you.

Yours truly,
MARTIN MARUGG, President.

Success to you, Mr. Marugg, and we hope this notice will bring you the man and the money.

KILLED AT THE 'PHONE.

James J. Doyle, Jr., at Smartville, California, a lineman in the employ of the Bay Cities Power Company, was instantly killed from the effects of an electric shock sustained by him while endeavoring to telephone from that place to some point along the line of the company's work. He had taken the receiver down and placed it to his ear when he was stricken, and died within a few moments.

The accident was in all likelihood due to a wire carrying a current under heavy voltage falling against the telephone wire. The deceased was twenty-seven years of age, and was born in Smartville. For convenience the telephone was installed at his residence so that he might be able to call up, day or night.

BELL WORKS FOR UNCLE SAM.

Alexander Graham Bell, the telephone man, a millionaire several times over, has been serving as a special agent of the census bureau. He had charge of the enumeration of deaf, dumb and blind population, and is now preparing his report. Mr. Bell, who in early life was an instructor in a deaf and dumb asylum, draws $6 per day from the Government while engaged in this census work.

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INVESTIGATES INDEPENDENT EXCHANGES.

Mr. Leonard G. Cox, of Lexington, Kentucky, who has recently returned from a trip thru Ohio, Indiana and New York, during which he visited Cleveland, Indianapolis, Baltimore and Rochester, said:

I was informed while in Rochester by parties not in the least interested in the home enterprise that the exorbitant rates and the unreasonable regulations of the Bell Telephone Company led some twenty enterprising and influential business men to expend over $300,000 in the erection and equipment of a new plant, called the Rochester Home Telephone Company. They installed the Stromberg-Carlson central-energy system, with underground installation and metallic circuit for each 'phone. It was agreed that no work should be done until two thousand five-year contracts had been obtained. At that time the Bell Company had only eighteen hundred 'phones, after being in operation over twenty years. The shareholders got to work at once, themselves soliciting subscriptions, and in a short time the two thousand five-year contracts were obtained. Service was begun in April, 1900, and after two thousand subscriptions had been obtained. soliciting was not necessary, as the excellence of the service increased the subscriptions, and it was soon necessary to increase the capacity, first to 2,500 'phones and then to 3,000, and now they are getting their switchboard ready for 3,600 'phones. The actual number of connections now is 3,006. The Bell Company has lost many of its old subscribers, and I found that practically no one kept the Bell 'phone except where it was necessary in the large manufacturing concerns and large jobbing-houses to have long-distance connection with New York city. The list of 1,800 of the Bell Telephone Company has decreased, but it was impossible to tell the exact number that it had lost, as it had not put out a revised list of subscribers. This is only a sample of what is occurring in many towns in northern New York and Ohio. The methods of the Bell Company have caused great dissatisfaction, and the revolt against high prices and poor service has spread to almost all of the larger cities.

The home telephone companies at Baltimore, Cleveland, Ohio; Richmond, Indiana, and various other points have been equally successful as in Rochester. The home enterprises have succeeded because they give up-to-date service at a reasonable price and because the people desire to help their friends who have delivered them from the power of a trust.

A number of the large business houses in Rochester have two 'phones in their business houses, both the Home and the Bell 'phone, but the individual members of the firm and employes have one "Home" at their residence. I found this to be true in many cases, and it was the expressed desire of most of the houses that they would be able in a short time to throw the Bell 'phone out entirely.

KANSAS CITY COUNCIL REDUCES TELEPHONE RATES.

Mayor Reed signed the ordinance reducing telephone rates to $48 a year for business 'phones and $30 for residence 'phones, and sent a letter to City Counselor Middlebrook asking him immediately to take steps to enforce it.

A penalty of $100 to $300 is imposed for a violation of the law. City Counselor Middlebrook decided that the proper step to take was to ascertain if any contract for a telephone has yet been made since the signing of the ordinance, and if the rates prescribed in the ordinance were not charged to arrest officials of the company under the ordinance.

COUNCIL TO FIX RATES.

The council committee of Davenport, Iowa, recommend the granting of a new telephone franchise to the Iowa Telephone Company.

To Section 12 the clause, giving the following rates, was attached as an amendment. E. E. Cook stated that the rates would never be in excess of those amounts:

For special business service (tri-city, Rock Island, Davenport and Moline), $60 per year.

For two parties on line, $45 per year.

For three parties on line, $39 per year.

For four parties on line, $33 per year.

For special residence service (tri-city), $51 per year.

For two parties on line, $39 per year.

For three parties on line, $33 per year.

For four parties on line, $30 per year.

For special business 'phone, local service only, $48 per year.

For two parties on line, $36 per year.

For three parties on line, $30 per year.

For four parties on line, $27 per year.

For special single-line residence 'phone for local service only, $39 per year.

For two parties on line, $33 per year.

For three parties on line, $27 per year.

For telephoning to Rock Island and Moline, or along the toll lines, extra

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compensation will be collected. A charge of 5 cents for each connection with Rock Island and Moline will be made.

E. E. Cook strenuously refused to allow the ordinance to be construed so as to compel the company to pay to the city a portion of the gross earnings. He instanced the Mutual Telephone Company, of Des Moines, which is now bankrupt. He said a telephone company was analogous to a public carrier, the same as a railroad, and that rates can be adjusted whenever necessary.

TOO MUCH INDEPENDENT.

Seattle, Washington, has a three-cornered telephone fight within herself.

The Sunset Bell Company has been doing business for years, taking care of about one-third of the possible subscribers.

In 1899 an Independent company was granted a franchise under the name of Seattle Automatic Telephone Company, and then rested on its oars.

A few months ago Mr. McGroarty and his friends applied for and in January last were granted a franchise for an Independent exchange.

Mr. E. A. Seeley and his associates also applied for and wanted Mr. McGroarty's franchise, or rather wanted one like it first granted to them. The contest took a decidedly novel turn when last Saturday it was announced that Mr. Hunt and Mr. Seeley, acting for Eastern capitalists, had purchased outright the entire capital stock of the Seattle Automatic Telephone Company. It was given out that the company would at once proceed to work under this company's franchise, which was granted in 1899 to Frank B. Ingersoll and a number of other Seattle men.

As a result of the sale of the stock a new board of directors of the Automatic Telephone Company was chosen, in which a number of prominent Seattle capitalists figure. The new board is as follows: Jacob Furth, president of the Puget Sound National Bank; John Collins, C. J. Smith, J. S. Goldsmith and E. A. Seeley, all of Seattle; Jules Vautrot, Jr., of Warren, Ohio, and A. E. Adams, of Youngstown, Ohio.

Mr. Vautrot made the following statement regarding the plans of the company:

"You can say that we shall construct in Seattle as good a telephone system as exists in the country. We mean business. We shall install the same pattern of apparatus as was used by us in the construction of the plants just completed at Birmingham, Alabama, and at Aurora, Illinois. The switchboards used by us will make it possible to guarantee a six-second service — that is, that patrons will have to wait but six seconds from the time of asking for a number until it is received.

"The telephones will be exclusively single-line service. Our plant will have a capacity ultimately of from 8,000 to 10,000 'phones, but we expect to install only 4,000 or 5,000 at first. The plant will cost over $300,000."

Early last month a bill was introduced in the Board of Public Works to revoke the Automatic franchise. The board wrestled with the situation and then left it to the courts. Meantime the Automatic Company secured a temporary injunction restraining the city from interference. The city corporation counsel then passed his opinion to the Board of Public Works to the effect that the Automatic franchise was valid. Then the board granted the Seeley Company the permits asked for. No small activity meanwhile was shown by Mr. McGroarty and his people, whose franchise was granted over the veto of Mayor Humes. They filed a certified check for $3,500 with the city comptroller in compliance with the terms of the franchise. The check is forfeitable to the city if Mr. McGroarty and his associates fail to build the line.

Solicitors for the company, which is to be known as the Independent Telephone Company, have entered the local field in quest of contracts. Mr. McGroarty said last night that not until 5,000 bona fide subscribers had been obtained would the patrons of the company be asked to pay for the service.

"The Independent Telephone Company," Mr. McGroarty said, "Will be distinctly a Seattle institution. Our board of directors will be composed of

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substantial business men and property owners of this city, and they will control."

The spectacle of two warring Independents is unusual and we hope to soon see them unite and spend their money fighting the Bell and not each other.

A PERTINENT CRITICISM FROM HENRY COIT.

ST. LOUIS, MO., January 25, 1901.

Electrical Engineering and Telephone Magazine, Monadnock bldg., Chicago, Illinois:

GENTLEMEN,— I read some few days ago the statement of the Chicago and Central Union Telephone Companies, together with the president's reports.

I wish to take exception to some of President Jackson's remarks, as being rather inconsistent. He stated that Independent companies are organized for the purpose of blackmailing his institution into a sell-out or consolidation. The article referred to gave itemized statements of the affairs of the Chicago Telephone Company and the Central Union Telephone Company, showing their profits and expenditures, assets and liabilities, etc. The Chicago Telephone Company shows that its net earnings are $870,457.94, which is over twenty-seven per cent of its gross receipts, and is something over twelve per cent on its capital stock of $7,000,000. In their itemized statement they make large allowances for a surplus and set aside a large amount of money for repairs and reëquipment. The Central Union Company shows equally as great an earning capacity.

Following this glaring statement of exorbitant profits comes President Jackson's report, which reads as follows:

"While parallelism, or so-called competition, has made no particular headway during the last year, it is reasonable to expect that some inroads will be made in our revenue on this account for some time to come, as in the past. It is well to remember that telephone competition is not being developed for the purpose of serving the public continuously as a competitive enterprise, but for the enrichment of certain manufacturers and promoters, and finally to blackmail our institution into a purchase or consolidation. The rates at which most of them are exploited are such as to invite bankruptcy at no late date, and none of them can continue to maintain themselves as a going business beyond the time when rapid deterioration of property commences to take effect. We are being continually invited, directly or indirectly, to purchase or deal with these properties. Should we do so, it would mean our own undoing, by reason of adding a plant or capital cost to the business largely in excess of present or future possibilities of its earning power or value. There is, therefore, apparently but one solution to this question, and that upon the hypothesis of survival of the fittest."

In view of the fact of the earning capacity of the companies referred to above, the foregoing report seems to show a little inconsistency. If taken literally, it would seem, while the Bell institutions can make unheard-of earnings, competition can not live, and that bankruptcy awaits, at a near date, all companies who dare to compete with the so-called monopoly. There seems to be considerable difference between tweedle-dee and tweedle-dum, in President Jackson's opinion.

He further avers, as per his statement, that the millions of dollars that have so far been invested in Independent telephone enterprises have been so invested for the sole benefit and enrichment of "certain manufacturers" and "promoters," and with the final purpose of blackmailing that Boston Benevolent Society into purchasing independent plants outright, or into a consolidation. He does not allow any room for the belief that the investors put their money into these enterprises along legitimate lines for the purpose of reaping a reasonable interest on their investment and capital. Numbers of Independent companies have been in the business long enough, it seems to me, to test whether or not they could successfully compete with the various Bell institutions, and if President Jackson will look over the records of the Bell companies who have been in competition, he would find that

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the results are anything but discouraging to the Independent movement. While he states that the promotion of competitive companies has been for the sole enrichment of manufacturers and promoters, he fails to say for what purpose the Bell organizations have been operating.

The statement of the parent company, of December 31, 1898, shows that on a business of $65,401,736.02 they realized a clear profit of $43,009,764.58, or considerably over fifty per cent of their gross income was profits. If they can realize such profits as that, after allowing handsomely for reserve funds, funds for reëquipment of apparatus and expensive salaried officials, is the inference not irresistible that Independent companies can make a fair profit on legitimate investment, charging reasonable rates?

Mr. Jackson finally concludes by saying that the only solution of the telephone competition is the survival of the fittest. If this is correct, the Independent companies have nothing to fear as to the ultimate outcome, for they are not overloaded with bonded debt, nor have they a long list of over-paid officials, while in every instance they have the hearty good-will of the public.

Very truly yours,

HENRY A. COIT.

PROFESSOR PUPIN LECTURES.

Prof. M. I. Pupin, of Columbia University, New York, spoke to a large audience in Johns Hopkins University about the improvements he has made in telephoning over long distances. The lecturer led up to his subject by discussing briefly wave motion in general. He said there was an analogy between electrical phenomena and matter in motion — in fact, both obeyed the same laws. Professor Pupin illustrated wave motion roughly by using a rope. He said the end in view in transmitting a current of electricity thru a wire for effective telephoning purposes was to prevent the attenuation of the current. Frictional resistance in a wire causes heat, and heat means loss of energy. There is also mass or inertia resistance, and his problem was to reduce or overcome the heat resistance by increasing the mass of the substance thru which the current is transmitted. His idea was to get the current to the other end of a long wire with sufficient energy to carry the vibration of the voice. The velocity of the current is a secondary consideration. A low current is the effective agent.

Professor Henry, an American, found many years ago that by coiling wire close together the electrical mass, or inertia, so to speak, was increased, and this idea Professor Pupin employed in order to decrease the waste caused by heat along the wire, so that the current might not become too attenuated to be effective at the other end. He constructed in his laboratory a line of wire for telephoning representing two hundred and fifty miles. Before the coils were used the notes of the voice, except the higher ones, could be heard at one hundred miles. At 112 miles all the voice tones were indistinguishable; only sounds like that of tapping on a drum could be heard. The coils were then put in, and the voice could easily be heard over the whole line. The Bell Telephone Company, Professor Pupin said, had tried the coils on a long line with the best results.

It was found that sixteen of the coils — each coil being enclosed in a box and put on the wire — were necessary on a wave length of wire — that is, one for every two miles. Professor Pupin tried one coil for every ten miles, but the results were not satisfactory. The wire used is an ordinary copper wire.

"I have been asked," said Professor Pupin, "whether it will be possible, by constructing a cable fitted with these coils, to telephone from America to England. I see no reason at all why conversation can not be carried by means of this invention over a wire three thousand miles long, or even at greater distance. Scientifically, there is no obstacle in the way to prevent it."

Thruout the lecture Professor Pupin did not once refer to himself as the inventor. He would say, "We found" such and such to be the case. In conclusion he said: "There is nothing remarkable or wonderful about the results that

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have been obtained by these experiments. It is all very simple. Most discoveries are simple. The difficulty is in our heads."

Professor Pupin is not a fluent speaker, but he makes everything clear, and if he does not know a thing he frankly says so. His lecture was illustrated by a few pictures. Professor Pupin is a Servian by birth, and was at one time a house painter and later supported himself by teaching.

Professor Ames, of the department of physics in the Johns Hopkins, introduced Professor Pupin, and said at the close of the lecture it was worth noting that this great discovery had been made in the laboratory of a great university, and not in a machine shop. He said there was hope that many more valuable results might come from the universities.

STATE TO FIX RATE.

In the Massachusetts House of Representatives, Mr. Hunt, of Weymouth, introduced a bill to establish, within a radius of twenty-five miles from the central station, an unlimited telephone service rate of not more than $100 in cities of more than 500,000 inhabitants; between 100,000 and 500,000 inhabitants, a rate of $75; in cities of from 20,000 to 100,000, a rate of $50, and cities and towns of less than 20,000, not exceeding $25.

'PHONE CHARGES FIXED IN MISSISSIPPI.

The Railroad Commission of Mississippi has passed an order supervising charges for telephone messages and rent of 'phones. The maximum rates in the county are fixed at 25 cents; in the State, $1. Maximum charge for residence 'phones, $2; minimum, $1. Business 'phones, $4 per month. The order was hotly contested by the Cumberland Company.

FIVE CENTS PER SWITCH.

At Munith, Michigan, a meeting of the stockholders of the eight rural lines centering there decided to hire a common operator and pay him at the rate of 5 cents per switch. The total number of 'phones on the eight lines is 175.

MORE SUBMARINE CABLES.

A cable dispatch from Berlin, of January 19, says that the project of a net of cables to cover the world is being diligently pursued by Germany, and is most actively furthered by the Emperor, who made some significant utterances on the subject to Privy Postal Councillor Strecker recently. The latest shape of the project, so far as the Far East is concerned, is as follows: Germany and the Netherlands to jointly lay a cable, which will go thru the Dutch Indies, touching at the Natuna Islands, Billiton, Palembang, Batavia, Macassar, Amboina, German New Guinea and the Carolines, with a central point at Shanghai, thence branching from Kiao-Chau easterly to Japan and America. The Dutch government will lay the cable thru its own colonies, and Germany will do the rest. The financing of this project is about concluded in principle. The plan of General Von Podbielski, the imperial postmaster-general, for gradually raising the annual appropriations to a maximum of 6,000,000 marks in 1920 has been approved by Emperor William. But if private companies, with a state subvention, will undertake the work, General Von Podbielski will not object.

IN NORWAY.

The telephone service of the kingdom of Norway is now in the hands of the government, which has purchased, at a great expense, the private telephones in the country, and telephone communication has been established between Bergen and Christiania.

AN OPEN FRANCHISE.

After a stormy session the city council of Logansport, Indiana, passed the telephone ordinance submitted by citizens, which opens the field to all competition, under the restricted rates of $12 for residence and $18 for business houses. If the Bell Company declines to accept the terms of the franchise a citizens' company will occupy the field. A resolution was adopted authorizing the bringing of a suit to revoke the Mutual Company's franchise, which is alleged to be the property of the Bell Company.

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A RULING ON SHADE TREES.

At Marietta, Ohio, Judge Coultrap, of the Common Pleas Court, in rendering a decision on a demurrer in the case of Anselm T. Nye against the Marietta Telephone Company, made some remarks that have a great deal of bearing upon the community in general.

The plaintiff brought suit for damages against the Marietta Telephone Company for mutilating two large elm trees in front of the property owned by the former on Washington street. In the course of his remarks, the Court stated that the city council did not have the power to allow the mutilation of trees unless the abutting property owners were compensated for their damage. Council has power to prevent the holders of a franchise from mutilating anything that conduces to the welfare and beauty of a community.

Companies or corporations using public land or property must not interfere with the rights of abutting owners unless compensation is made. A property owner could not have more important rights than in the enjoyment derived from the shade trees that shelter and beautify his premises.

The Court held that the answer to the petition did not show that it was necessary to mutilate the trees in this particular instance, and the burden of proof in that respect must be on the defendant. The demurrer to the second defense is therefore sustained.

CAN NOT SUE A COMPANY FOR DEBTS OF MANAGER.

At Fort Madison, Iowa, in the District Court, in the case of the Iowa Telephone Company et al. vs. Fenton Barnett et al., the court rendered a decision in favor of the plaintiff. Barnett garnisheed the company for a debt contracted by F. M. Gustin, then the local manager of the company in Fort Madison. The case was tried before Justice Hayes, of Washington township, where a judgment was given plaintiff. The defendant company appealed to the District Court for an injunction against the execution of the judgment, which was decided as above stated.

TELEPHONE PAYS FOR A LIGHTNING FATALITY.

A damage case has been settled at Tuscaloosa, Alabama, which had no precedent in law. The case grew out of a unique tragedy. Last April O. B. Wilson, who was superintendent at Stillman Institute, was talking thru a Bell telephone when he was struck by a bolt of lightning, which passed thru the receiver into his ear, causing instant death. The executors accepted the sum of $1,800 from the Southern Bell Telephone & Telegraph Company in full settlement of the former's claim for $25,000 for the death of the intestate.

NEW INDEPENDENT ORGANIZATION.

The Northern Indiana & Southern Michigan Telephone Company has been organized for the purpose of acquiring and operating telephone lines. The bulk of the stock of the company has been subscribed by a number of local capitalists, who will take over a number of lines which are operating in the two States named, and it is the purpose to unite them so that the fight against the American Bell Telephone Company can be waged more successfully. The company has options on a large number of local points and its intentions are to have a thru line from Toledo, Ohio, to Chicago.

TO CONDEMN LAND FOR PLACING POLES.

Forewarned is forearmed, and a bill has been introduced in the Wisconsin Assembly in which all telephone companies are interested. The measure clothes telephone companies with authority to condemn land for the building of its poles on the highway. The measure is without doubt the result of the Wisconsin Supreme Court decision that the company has no right to occupy land for its poles without paying compensation for the property, and is intended to prevent future litigation of the character waged by a Neenah druggist to compel the company to pay for land used for its poles and also to make good any damage which may be caused by their erection in front of property.

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INDEPENDENT SITUATION IN MICHIGAN.

J. B. Ware, secretary Citizens' Telephone Company, Grand Rapids, Michigan, and president of the Independent State Association of Michigan, in a letter covering the progress of the Independent movement in Michigan, writes in part as follows:

As a matter of fact, the Independent companies of the State have been successful, not only in the building up of exchanges and toll lines thruout the State, but a number of companies have been paying two per cent quarterly dividends, with every prospect of continuing the dividends permanently. This is

J. B. WARE.

true of our own company, our Muskegon Company, the Twin City Company, of Benton Harbor, the Adrian Company, and, I think, the Alma Company, in the central and western portion of the State, also the Saginaw district, including the Thumb.

The Independents have more telephones in service, more exchanges, and reach nearly twice as many toll stations as the Michigan (Bell). Our company reaches 231 towns and offices within fifty miles of Grand Rapids, the Michigan (Bell) reaching but ninety-five in the same district.

We have just completed our copper metallic lines thru to Traverse City, opening up the Sherman, Opemish, Thompsonville and Frankfort districts, which heretofore have never had telephones.

We have rebuilt our Lansing exchange, and are giving a strictly first-class service, which is more than can be said of the Bell exchange.

The Alma Company has, during the past summer and fall, extended its copper lines from Ithaca north to Harrison, and from Saginaw to Howard City, so that Grand Rapids can get strictly first-class telephone toll service to Traverse City, Saginaw, Lansing and intervening points.

The United States Company, of Cleveland, Ohio, the largest and wealthiest telephone company in the Independent field, has completed its lines from Saginaw thru Owosso and Lansing to Jackson, which last city granted a franchise for the building of the Jackson lines, which will be done immediately. The line has been completed to Napoleon, and within about eighty days will be finished to Adrian and Toledo, there connecting with the United States system, giving service to our exchange and to more points in Ohio than is reached by the Bell Company. During the next six months, Pennsylvania, Ohio, Indiana and Michigan Independents will be connected together by long-distance wires.

The financial trouble of the Erie Company will undoubtedly cause the cessation of the unreasonable expenditure of money which has been so conspicuous during the past two years in this State. No other policy can prove to as great disadvantage to the Independents and we have every reason to believe that the recent granting of franchise at Detroit for an Independent exchange and the getting of United States lines thru the State, as above mentioned, the present year will show a far greater increase and development than either of the past years among the Independents. Yours very truly,

J. B. WARE.

IN the territory covered by the Union Telephone Company, Alma, Michigan, its relative strength compared with the Michigan Company (Erie-Bell) is as follows: Points reached by Union only, 37; points reached by Bell only, 1; points reached by both, 46. The Union has 19 exchanges, 42 toll stations, 954 telephones. The Bell has 3 exchanges, 20 toll stations and 176 telephones. The Union Company is out of debt and pays eight per cent cash dividends annually. The Kalamazoo and Detroit companies had no telephone property in the Union Company's territory, and Bell interests have made no purchases therein.

OWOSSO COMPANY ENJOINS THE MICHIGAN (BELL).

Trouble has arisen of late between the Michigan Telephone Company and the Owosso Telephone Company, and the two have now gone into court. The

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Owosso Company formerly had contracts with the New State Company, of Detroit, but since that company was absorbed by the Bell, the latter has been making preparations to cut off its service. Last week the matter came to a head and the towns of Vernon, Durand, Bancroft and Byron were entirely disconnected from service with the Owosso Company. The Detroit service had not been interrupted, however, when a temporary injunction was asked for and granted, and the entire matter is now in the hands of the court for settlement.

HOW THE HOSACK BILL AFFECTS THE TELEPHONE IN PENNSYLVANIA.

Representative George M. Hosack, of the Fifth District of Pennsylvania, has introduced a telephone bill to prevent consolidation. In his own words, "The object and purpose of the bill is, as the title indicates, to prevent the consolidation of competing lines, for the holding of the controlling interest of the stock and bonds of competing telephone companies, for the acquisition or control, either directly or indirectly, of one competing telephone company by another.

"No person or corporation requested me to introduce the bill. The act of 1883 relating to telegraph companies did not appear to cover telephone companies. There are thousands of telephones in use in this and other cities where there are several competing companies, and it seemed to me that there was a possibility of in some way at some time consolidating their interests or making such arrangements that the thousands of subscribers would not enjoy the benefits of competition.

"It is really putting into effect the constitutional provision which prevents the consolidation of competing railroads and other companies to preserve competition. What is good law for railroads and telegraph companies should also apply to telephone companies.

"It is certainly not the intention that any restriction shall apply to any telephone company which is endeavoring to extend its lines thruout the State or adjoining States from controlling companies already in existence in different towns where those lines are not competitors with what is intended to be a parent company. It is intended that this act, if passed, shall be a benefit to the public, and if in its present shape there is any doubt of it being such, to amend it. It is not intended to prevent competition, but to make it."

The Hosack bill is comprehensive and its terms of forfeiture are drastic. The bill provides that no corporation, association, partnership or individual owning, operating or controlling any telephone line or lines shall acquire, either by purchase, lease or otherwise, any competing telephone line, or the controlling interest in the stock or bonds of such a line, nor in any way, directly or indirectly, control, operate or own it or the controlling interest in its stock and bonds.

The stock and bonds that may be taken in violation of the proposed law, together with all the franchises so purchased, leased, controlled or otherwise acquired, and the earnings thereof from the date of the purchase, lease or acquisition of the controlling interest, shall be forfeited to and become the property of the commonwealth. Such forfeiture to the commonwealth may be decreed, under quo warranto proceedings, in any common pleas court of the State. Appeal may be made to the Supreme Court within six months after the decree. The court before which proceedings begin shall appoint a receiver, upon due cause shown, or require the defendant to execute bonds in sufficient amount for the payment into court, on the termination of the litigation, of the earnings of the competing telephone line.

After a final decree establishing the forfeiture, the court shall order the forfeited line, franchise stock and bonds to be sold at public auction by the sheriff after four successive weeks' published notice. The sale shall be to the highest and best bidder on terms fixed by the court. The sheriff shall give the auditor-general and attorney-general at least twenty days' notice of the time and place of the sale.

No corporation, association, partnership or individual owning, controlling

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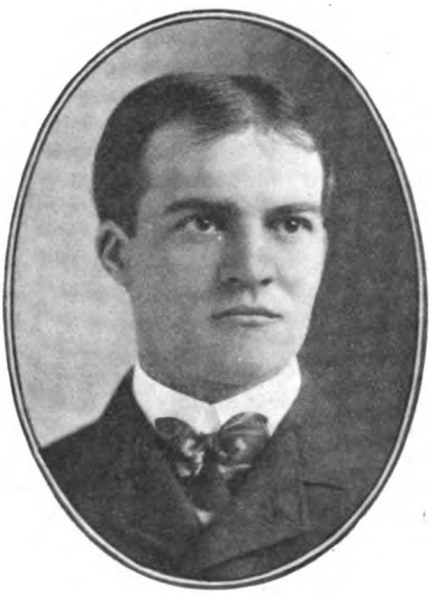
or operating any competing telephone line or the controlling interest in the stock or bonds thereof, shall become the purchaser at such sale without becoming liable for the amount of the bid, and then shall acquire no title to the property thus purchased.

On confirmation of the sale and payment of the purchase money into court, with the earnings of the forfeited line, the court shall appoint an auditor to distribute the money. The innocent



GEORGE M. HOSACK.

stock and bond holders, who neither directly nor indirectly aided in the violation of the act, shall receive the market value of their stock and bonds with interest.

All mortgages, liens or incumbrances placed on any telephone line after violation of the act with regard thereto, and any such incumbrances placed with the view of such violation, shall be null and void.

The court shall have power to summon officers of the concerns referred to, to appear with all or any of their books and papers, and to be examined on oath for the purpose of showing whether the law has been violated, or the court may direct to be filed a bill of discovery against such officers, directors, trustees, managers or individual owners, who must make complete answer.

The purchaser of forfeited property shall be entitled to all the rights and privileges which the telephone line had, and shall notify the secretary of the commonwealth and the auditor-general of particulars of the purchase within thirty days after the court's confirmation of the sale.

Upon reorganization of the corporation, association or partnership, which must take place within ninety days after confirmation of the sale, the secretary of state and auditor-general must be fully notified.

Coming from a member with the standing of Hosack, chairman of the Ways and Means Committee two years ago, the bill may make better progress than is likely to characterize the average insurgent measure. Altho anti-Quay, Hosack has been exceptionally well favored in committee appointments and otherwise, and has many Quayite friends. The bill is bound to have strong support and will make things very interesting for the Bell interests if passed. It will prevent, for instance, the Bell Company from acquiring control of the Keystone Telephone Company, of Philadelphia, recently organized with a capital of $2,000,000, which has been since increased to $10,000,000. The passage of the bill will insure the Keystone remaining an Independent company and will prevent the purchase by the Bell Company of competitive exchanges in the State.

BELL COMPANY IS OPPOSED.

The Northern Indiana & Southern Michigan Telephone Company, with $50,000 capital, has been organized in La Grange, Indiana, by local capitalists for the purpose of securing a number of short lines in the two States named and in Ohio for thru communication between Toledo, Detroit and intermediate cities and Chicago. The principal object is to compete with the American Bell Company. A number of options have already been secured on Independent short lines.

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KEYSTONE IS ACTIVE.

Robert H. Foerderer, president of the Keystone Telephone Company, of Philadelphia, announces that the company expects to be in active business by September in the district bounded by Fairmount avenue, Christian street and the two rivers. Within ten days, he says, contracts will be awarded for the laying of seventy-five miles of conduits, with 3,000,000 feet of ducts and nearly one thousand manholes. The use of the city conduits, on rental, has been arranged for, and also the conduits built by the Standard Company on Market street, which, as previously announced, have been purchased by the Keystone Company. In the course of a few weeks the company will move into the old Chamber of Commerce building, on Second street, above Walnut, recently bought for the purpose, and which is to be one of the company's stations. Mr. Foerderer says the Keystone Company will use the common battery system, the same that is used by the Bell Company, and that for unlimited service the rates will be $80 for a business 'phone, $52 where a two-party line is used, and as low as $36 for residence 'phones.

LONG-DISTANCE EXTENSION IN VIRGINIA.

Now that the charter granted the Long-Distance Telephone Company, of Virginia, by the Circuit Court of the county of Augusta has been sanctioned by the General Assembly, and the powers of the corporation enlarged by the Legislature, so as to permit the company to exercise the right of condemnation proceedings, it is expected that every section in the Old Dominion will be more closely connected by this system of long-distance connection.

The company has been in existence less than a year, but is making rapid progress with the work of extending its lines.

It is the present intention to effect arrangements with the numerous local telephone companies, whereby the long-distance circuit can be strung on the poles already erected. This arrangement has already been effected in the valley, and the long-distance wire has been put up as far down as Harrisonburg. It will be continued down the valley certainly as far as Winchester. While the work is being pushed toward Winchester, it is also coming to Richmond via Gordonsville and Louisa. When this line shall have been completed, Richmond will have two long-distance facilities to Washington. The route in the valley will also be extended so as to include Lexington, Roanoke, Lynchburg and Bristol. In fact, it is said to be the aim of the promoters of the company to place every town of any size in the State on the circuit.

In many of the counties of the State there exist local companies, which own and have in operation hundreds of 'phones, public and private. It is the intention to give these 'phone holders the benefit of the long-distance facilities by having the long-distance circuit "tapped" in every county at the county exchange, where connection can be had for longer service than the local company can afford.

A SUCCESSFUL SYSTEM.

The Frederick County Telephone & Telegraph Company, of Frederick, Maryland, reports 550 'phones, covering the second richest agricultural county in the United States. Its growth has been remarkable. James E. Walker is president; Daniel T. Ordeman, secretary; Dr. Franklin Buchanan Smith, treasurer, and Dudley Page, superintendent.

TELEPHONES FOR PENNSYLVANIA RAILROAD.

At Salem, Ohio, the Columbiana County Telephone Company closed a contract with the Pennsylvania Company whereby telephones will be placed in every passenger and freight office as well as telegraph office in the county.

PUBLIC HIGHWAYS FREE.

At St. Paul, Minnesota, the Burns bill, giving individuals the right, now enjoyed by corporations only, to erect telephone and telegraph lines along the public highways, was passed in the House without opposition.

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TALKS AND CROSS-TALKS.

BY A. E. DOBBS.

HINTS TO CORRESPONDENTS.

Write on one side of the paper only, and make sketch or diagram, when necessary. Endeavor to give all the facts bearing on the case, so as to enable the editor to answer intelligently.

Name and address must accompany each letter, not for publication, but for the information of the publisher.

A GOOD IDEA.

We are in receipt of a very interesting letter from J. E. Sangwin, of Lamar, Colorado, describing a system of test stations in use on his telephone lines which have an aggregate length of over 200 miles, and which is shown in Fig. 1.

At each house connection there are placed three small double pole-knife switches such as are often used in electric-light work, one being connected to the east end, one to the west end, and one to the house drop.

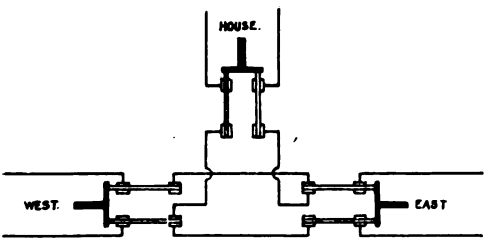

FIG. 1.

In case of trouble opening the east switch allows a test to be made of the west branch from the house telephone, and vice versa. Should the trouble be in the house loop, opening the house switch will clear the line.

He also suggests that as he once had a peculiar case of trouble caused by a wire being broken inside of the insulation, which would sometimes ring and sometimes not, possibly that was the trouble with No. 66, as noted last month, but this has been already correctly diagnosed by Mr. Schlosser as noted above.

We are always glad to get items of this kind from managers and superintendents.

A PUZZLE.

79. Can you tell me how to find the proper way to connect a receiver in the accompanying sketch (Fig. 2)? In central battery systems of this kind, getting the wrong pole of the receiver to oppose the battery will in time demagnetize it and I would like some way of determining when I have the right pole connected to the "tip" side.

Who can answer this?

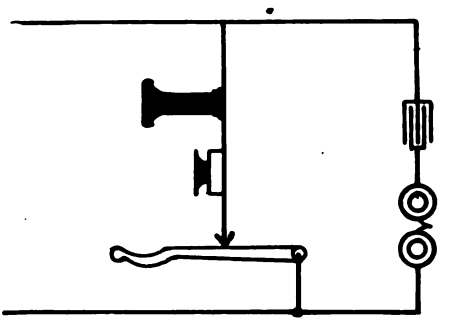

FIG. 2.

TWO MORE REPLIES TO QUESTION 66.

80. DEAR SIR,—Your man (No. 66) in the January issue seems to have located his trouble when he tested from the cable box to subscriber and switchboard. The trouble must necessarily be in the connections in the cable box.

If he uses the style with carbon lightning arrester, the carbons could be touching the ground strip, or, if fuses cross ground-bar they could be touching, or, if mounted on wood board, it probably has a nail driven in and touching two screws.

J. E. PRYOR,
Manager Rock Hill Telephone Company,
Rock Hill, S. C.

81. DEAR SIR,— I would like to know what style of switchboard C. C. (No. 66) has. If he has a metallic-circuit board and, as he says, keeps the lines full metallic to the cable terminal, his trouble is beyond me. But I mistake; he does not say the lines are full metallic, but that the cables are. This would allow the inference that his board is of the common-return style, one side of all lines going to ground or common-return bus-bar.

In this case, I think his trouble is just a cross-connection between the cable terminal and the switchboard.

In this case, throwing the subscriber to the

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common-return post and the line to the ground terminal should help him out.

W. M. LANNAN.

REMARKS BY THE INSPECTOR.

An inquiry and suggestion contained in a personal letter from the Inspector revealed that the trouble was not quite correctly described. The board and cables are metallic thruout and the trouble was a cross-connection in the cable pair. In a system of this kind the "tip" spring of the jack is generally given to the line and the "sleeve" to the ground or common-return side of the pair. Now if by mistake the "line" side of the pair should be connected to the common-return bus-bar, and the "ground" to the line, there would be a cross at the terminal, tho both ends would test "clear" when opened.

A POSSIBLE ERROR CORRECTED.

In the TELEPHONE MAGAZINE for February, in answer to question 75, page 75, there is given the size of wire and number of turns on the different sizes of ringer spools. I omitted stating that the number of turns given were to be applied to one spool only, so that on both spools the total number of turns would be doubled, as follows:

Resistance.	Size of Wire.	No. of turns. (one spool).	Total No. turns.
80 ohms.	31	2,000	4,000
500 "	36	3,700	7,400
1,000 "	36	7,000	14,000
1,600 "	36	10,000	20,000

It must not be forgotten that the number of turns given above depend very largely upon the size of the spool, length of spool and also whether the wire is covered with cotton or silk.

The object in winding is to get a certain number of feet of wire around the spool within magnetizing distance of its core, which is the only reason that small wire is used, because in order to make a magnet quickly responsive to weak currents it is necessary to use as small an amount of iron as will do the work which, of course, makes a small core. Now in order to make the iron as strongly magnetic as possible it is necessary to have a certain number of feet (or turns) around the core, but, on the other hand, this winding, to be effective, must not extend further out than about ¼ of an inch from the iron, as otherwise the lines of force radiated when the current passes over the wire are not sufficiently concentrated on the core and the effect of the magnetizing current is largely lost.

If, to get the wire closer to the core, we lengthen out the magnet, we not only decrease its sensibility by increasing its magnetic resistance—for there is such a thing as magnetic resistance as well as electrical resistance—but we also introduce inductive troubles, which are still worse. Therefore, in order to obtain a sensitive, quick-acting bell, we wind a comparatively few turns over a short, small core. In bridging work, however, we must sacrifice efficiency to obtain the proper retarding effect to the voice currents, that is, to prevent too much leakage, so our cores are longer and heavier, and this should always be noticed in buying this class of instruments.

We require a large number of turns, not to get resistance, for we would do without it if we could, but to get the necessary inductance. Let us suppose that a certain amount of current produces one line of force per 100 feet, and we need ten lines of force (the expression line of force being a shop term to designate a certain strength of magnetization) to operate a certain ringer magnet. A thousand feet of wire would therefore be necessary and it requires no mathematical ability to see that to get this amount of wire around a magnet spool it must be several sizes smaller than a trolley feeder, tho that would give us a negligible amount of resistance if it was possible to use it.

After a great deal of calculating, we find that the most economical wire to use, both from a mechanical, electrical and financial standpoint, to be, let us say, about No. 36 copper wire, which, unfortunately, has a resistance of about 420 ohms. Now while we can not but wish that resistance out of the circuit we can not get rid of it.

PATENT OFFICE INFORMATION.

In reply to friends who require specific information as to inventions, etc.,

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we would say that it is not fair to ask the Inspector to look up the Patent Office records to find out whether their inventions are worth anything, or if free from infringement. If their inventions are patentable or free from infringement they are the ones who are benefited, not the Inspector nor his readers. The usual charge for making a Patent search is $5.

82. To make a clearing-out drop of 500 ohms, how many turns of wire and what size of spool should be used? A. HOELSCHE.

Copy a spool from a 1,000 ohm ringer and cover with an iron tube.

NOT A BAD IDEA.

83. In the December issue of the magazine you describe a non-inductive shunt for making series lines as good as bridged. Why could not this line be also made a combination line, both series and bridged, as in the sketch

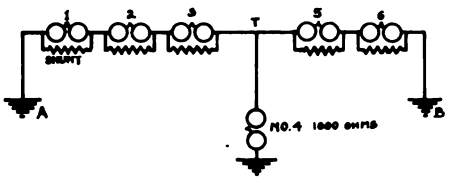

FIG. 3.

shown (Fig. 3), so that if there were any 'phones on the line say a mile away there would be no necessity of running out two wires, as in loop wiring?

GEORGE M. REMINGTON.

Your plan would be all right if the resistance of your line on either side of your bridged ringer should be great enough to allow of clear signaling. For example: Suppose that the resistance of your line from the ground at A to the tap T was, say, 500 ohms, while the line resistance from the tap T to the ground B is only 100 ohms. You will see in that case, supposing that station No. 4 tried to ring any of the others, that four-fifths of the current would go to the ground at B, and only one-fifth of it toward the ground at A. which would make rather poor signaling for Nos. 1, 2 and 3.

Then again; suppose that No. 1 should try to call No. 4, he would have a path one way of 100 ohms and the other way to No. 4 of over 1,000 ohms, a proportion of 10 to 1, which, I think, would not allow No. 4 to ring very loud, even tho it does take less current. If, however, the resistance of the line on either side of the tap T should be higher, say 400 ohms each side, then there would be little trouble in signaling, provided the generators were good.

A NUT FOR CENTRAL ENERGY MEN.

84. DEAR SIR,—I had a case of trouble which may interest a few of our central-energy friends, and after they have figured it out they will know their circuits as they should.

We have central calling with local talking battery. We ring out, ground and tip, with a grounded supervisory ring off, using a double 500-ohm relay for that purpose. Now, our trouble was this: All of the positions started talking into each other, so that two operators could not open their cams at the same time without getting things mixed. We also have a toll-board made by another firm which transfers thru trunks to local boards, and it was also in the mix-up.

After locating my trouble, I found it to be very simple, and I should like to have some of your readers guess the cause.

B. F. THOMPSON.

85. Will you kindly advise as to whether the alternating current keeps the relay R closed, as shown on page 24 of the January issue? G. E. MERRILL, Manager.

Practically, yes, altho there is a small amount of motion to the armature due to the reversals of current and a buzzing sound that makes one think that there is more vibration than really occurs.

When the current first passes thru, the armature of the relay is drawn forward, but when the current is reversed there is a tendency to throw the armature back, as it has become magnetized to the polarity of the first charge and, as is well known, like poles have a tendency to repel each other; but before the armature can act to the full extent the incoming current has magnetized it again in the opposite direction, and again drawn it forward, so that a relay under those circumstances will remain closed enough to continuously ring a vibrating bell placed in the circuit.

86. I have a lead connected as in the enclosed sketch (Fig. 4), and have a great deal of cross-talk in it. Is there any way to get rid of it? T. H. EVANS, Manager.

There are several changes the Inspector would make in the wiring of

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this lead that would help matters. Take the lines Nos. 2, 3 and 7 for example; it would be better if they were connected to the common-return wire, or that 1, 3 and 6 should be cut loose from the common return and grounded.

Neither would I use No. 9 iron wire for a common return except for a very short distance, but it is there, and we have to make the best of it for the present.

In laying out a lead of this kind it is well to keep in mind that the longer wires should occupy the center pins as much as possible, and the shorter lines the outside pins, which makes an orderly arrangement of the circuits.

Another thing I noticed is that the metallic circuit No. 5 occupies wires

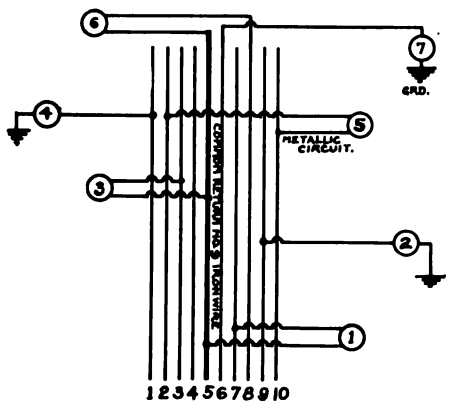

FIG. 4.

on opposite sides of the pole, which is nothing less than an electrical crime, and makes all kinds of electrical disturbances on both the metallic circuit and the wires in between the two legs.

In Fig. 5 I have shown how I would rearrange the circuits if I was not in a position to rebuild them.

Beginning with No. 1 take that from the outside line instead of from the center, as in Fig. 4, and the next one falls to pin No. 9 in the same way. This leaves pins 6 and 7 for the metallic circuit No. 5, which should in this case be transposed at regular intervals, say every sixth pole. By following up the other connections in the same way the work will be in a great deal better shape and the service much improved. This still leaves us with a common-return wire with at least 40 ohms resistance between the end and the office, with perhaps only 5 ohms between two adjacent telephones, which will make cross-talk in spite of all we can do. A No. 10 copper wire would be better, but we have not got it and perhaps can not get it right now, so the best thing we can do probably is to ground the common return at the end and also at one or two places in the middle, and in this way get the earth to help us out. In this case it would also be well to carry back a return wire from the grounded lines to the common wire. It is not necessary to make the lines of copper to obtain good service. I know one young inspec-

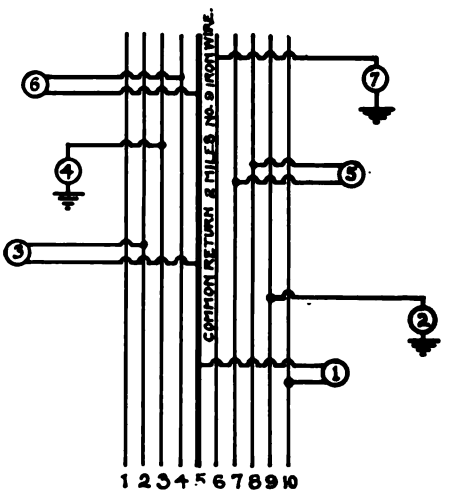

FIG. 5.

tor who, when he has single lines of two or three miles in length, goes a step further and breaks up the static induction still more by crossing his lines from one side of the arm to the other, as from pin 10 to pin 1 and so on. This may do some good in a lead carrying several wires, but it makes the lines hard to trace and it is doubtful whether its advantages counterbalance its disadvantages.

BARBED WIRE TELEPHONE LINES.

87. GENTLEMEN,— In a contemporary publication I read an article on barbed-wire fence lines, and I think the correspondent is somewhat in the shadow with his report. Iowa is literally cut up with wire-fence lines and has been using them for four years with good success, working as far as twenty miles on one

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line with no other insulation than the fence-posts give, and the barbed wire is used just as it is built by the farmers for fencing.

In several places the railroad fences have been used so much that the railroad companies have grounded the wires to keep them from being used in this way.

A. M. BARNES.

SUBSTITUTES FOR SAL AMMONIAC.

88. We have many inquiries in regard to several substitutes for sal ammoniac now being sold under the names of "Federal Salt," "Federalite," and the "A. B. C. Compound." Some who have tried them report that they have gone back to sal ammoniac and would like the experience of others who have tried them. BENJAMIN F. THOMPSON.

In regard to these compounds the Inspector has never tried them personally but has seen cards taken from some of them and the results were very encouraging from some of the tests made by those who had no interest in them one way or another.

It seems that the electromotive force is not quite as high from these compounds as from "sal," but in some cells it is more constant and the recuperation from short circuits rather more rapid, and there is no crystallization of salts as is the case where too much sal ammoniac is used, for it must be remembered that there is greater liability of getting too much than too little sal ammoniac in a cell. This question was discussed before the Illinois State Convention last June, and the opinion of those who had tried them was that there was also a great difference in the kind of cells used for the tests. Thus a cell like that in which the manganese is mixed with the carbon gave much better results than those having the manganese on the inside of a carbon cup, tests of the latter class of cell being rather unsatisfactory.

With sal ammoniac, however, the situation was reversed and the type of cell shown in Fig. 5 gives the best result.

This is merely thrown out as a suggestion to those who wish to try them, and after all that is the only way to find out about them.

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89. Speaking of batteries, a friend writes us from Minnesota in a very enthusiastic manner about a widely advertised dry cell that he has been using in his telephone work, and says that, all points considered, they are far ahead of any other kind he has tried. It is the experience of such men as these that makes these columns interesting.

W. C. WYCKOFF, Manager.

Let us have the name or make of the cell.

AN INTERESTING QUESTION.

90. Supposing that all the induction coils in an exchange are placed alike, does it make any difference whatever as to which side of them the zinc is connected? Would changing the polarity of an induction coil make any difference? H. R. ERICKSEN.

That is precisely what the Inspector would like to know. At first thought it would seem that as the current given out by an induction coil is alternating in character it would make no difference how the coil was connected up, and we well know that they work both ways, but it seems that they would be better for being all alike. One thing I do know, and that is, in a singing test of telephone receivers it makes a considerable difference in the tone to reverse the battery, from which it seems that it might make a difference in the transmission of vocal sounds also.

A NOISY LINE.

91. We have a single grounded line nine miles long, and always before a storm or heavy weather there is a considerable grinding or crackling noise in the telephone. Do you know any way to get rid of that noise without making it a metallic line?

JOSEPH H. PEACHY.

Look your line over carefully and examine the carbon arresters to see if they are clean and the line free from tree or other leakage, and that the insulators are not broken. If all right in this regard, then the only remedy I can suggest is to place a high resistance grounded leak, as a ringer of 1,000-ohm extension bell, about the middle of the line to relieve the static charge, which sometimes accumulates quite rapidly during a high, dry wind.

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92. In speaking of the common-return wire, do you mean that six lines can be made with only seven wires and still have no cross-talk? C. M. CAXTOLL.

Yes. Use a No. 10 copper wire for your return and connect one side of all your instruments to it, instead of the ground wire. You may have a small

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amount of cross-talk, but not enough to do any harm. See Fig. 5.

93. Suppose a telephone line using 1,000-ohm bridging bells has an intermediate station one mile from the main line; should the bells in that case be wound to a lower resistance in order to allow for the resistance of that mile of line wire? DAVID HUGHES.

As the generator gives more current than is really needed to actuate the bells such refinement of resistance is unnecessary in practice.

94. If there are several subscribers connected to one line, which is also connected to the switchboard, will they ring the drop every time they ring each other?

FRANK V. ALDEN.

Yes.

A MUNICIPAL EXCHANGE.

On the last day of the past century the corporation of Tunbridge Wells, England, inaugurated the first system of municipal telephones.

The exchange was built by the town council at a cost of $50,000, and provides service not only for the borough, but also for a radius of ten miles. At present the corporation has secured 400 subscribers, the majority of whom have been customers of the National Telephone Company.

The town guarantees to provide at a rate of $15 a year as efficient a service as the National Company at $20 per year, and expects at this reduced rate to make a profit which will be applied to the lowering of local rates.

Municipal authorities in all parts of the kingdom show much interest in the project, and Tunbridge Wells shares with Glasgow the distinction of being the first municipality in the new century to possess its own telephone service.

CONNECTING WITH INDEPENDENTS.

The general manager of the Maryland Telephone Company, at its annual meeting at Hagerstown, was authorized to contract with the Maryland Telephone & Telegraph Company, of Baltimore city, in reference to long-distance connections and for an interchange of business, and to make similar contracts with Independent companies in Pennsylvania, Virginia and West Virginia.

SAVAGE TELEPHONY.

Travelers in uncivilized countries have often wondered how many savage tribes were able to transmit news for hundreds of miles with no apparent facilities for doing so. An interesting light is thrown on this subject by John Bach, who tells of the means by which the Indians on the Amazon communicate with each other at a distance. The natives live in groups of 100 to 200 persons, in settlements half a mile or a mile apart. In each dwelling there is a wooden drum, which is buried for half its height in sand mixed with fragments of wood, bone and mica, and has a triple diaphragm of leather, wood and rubber. When the drum is struck with a wooden mallet the sound travels far and is distinctly heard in the other drums in the neighboring dwellings. It is beyond doubt that the transmission of sound takes place thru the earth, since the blows struck are scarcely audible outside of the houses in which the instruments are placed. After a "malocca," or dwelling, has been "called up" by an initial blow, conversation is carried on between the two drums. Mr. Bach's explanation is that the communication is facilitated by the nature of the ground, the drums doubtless resting upon one and the same stratum of rock, since transmission thru ordinary alluvial earth could not be depended upon. This method furnishes an ingenious modification of the process employed by Indians for perceiving distant noises (such as the gallop of a horse), which consists in applying the ear to the earth.

EXHIBIT OF THE KELLOGG SWITCHBOARD AND SUPPLY COMPANY AT THE WISCONSIN CONVENTION.

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MONTHLY DIGEST OF TELEPHONE AND KINDRED PATENTS

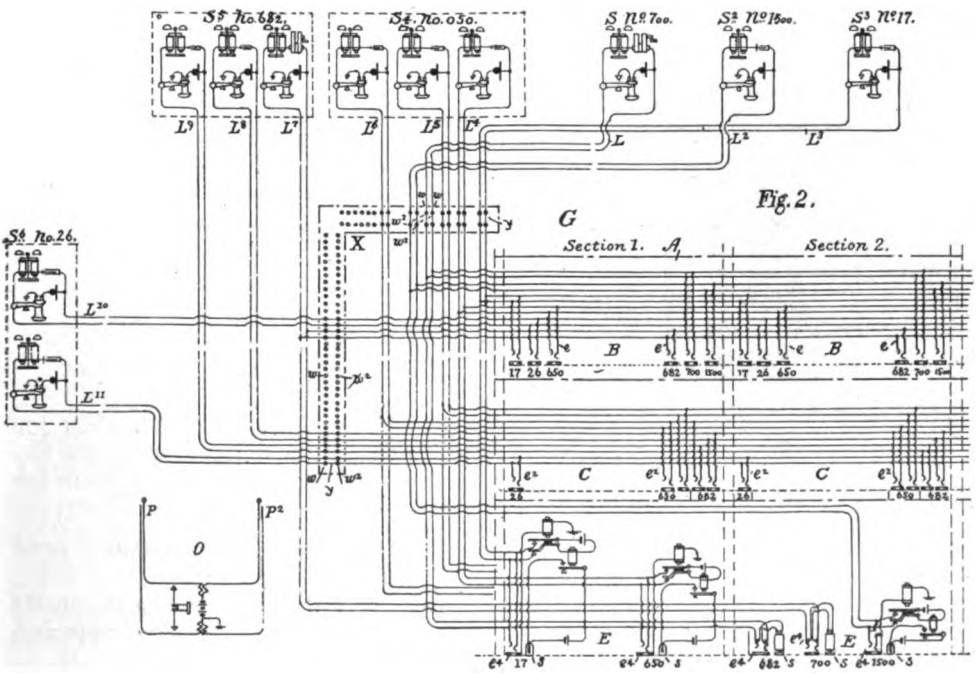
EDITED BY CLARENCE C. BROWN.

Copies may be had, postage paid, by enclosing 5 cents for each one. Address inquiries in care of this magazine or Washington, D. C.

No. 668,044.— FRANCIS L. GILMAN; dated February 12, 1901.

This invention is intended to be used in connection with large multiple boards. Business firms who, for the accommodation of their business, have two or three telephones each over a distinct circuit, which in the directory are grouped under one number, and each one having been added from time to time as needed, have caused them to be widely separated and in different panels of the board, so when a call is received and one of the jacks is busy, it is quite a task for the operator to search around for a jack that is not busy, and perhaps is not on her section of the board, and she is compelled to have another operator look for it. Now, in making a test, each one must be tested-out separately, which takes up a great deal of time. This invention eliminates this trouble in the following manner:

In the operation of the invention, whenever an operator receives a call for connection with a substation — say, for substation No. 650 — to ascertain whether the circuit wanted is engaged or not, she touches, with the calling plug P^2 of the cord circuit in use, the ring or end of the regular switch socket of No. 650, in the space B, and if the circuit tests "not busy," inserts the plug into the socket; but if the test shows the circuit to be engaged, instead of informing the calling subscriber of the fact, as is customary when but one line connects with the wanted substation, she, noticing the indicating color or configuration about the end of the switch socket, knows that there are one or more circuits to the same substation having special sockets in the special space of the switchboard, and therefore looks into the said special space for the same number that the regular socket bears, and



No. 668,044.

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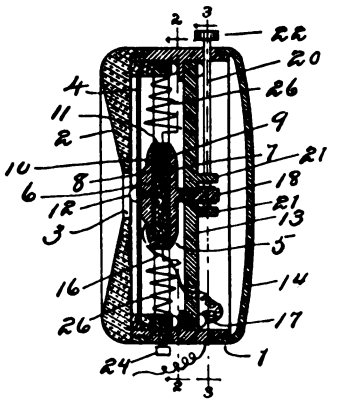
makes a test with the ring of the socket immediately over and included by said number, and if not busy inserts the plug in said socket. If there are more than one switch socket included by the substation number, and the first one proved to be engaged, the remaining sockets are tested until one is found disengaged, unless, indeed, all are found to be engaged, when the fact will be announced by the calling subscriber. The operator is assisted in finding a number in the special space C by the plates c^2 to the left of each bank of the strips. The panels are each shown as inclosing special switch sockets in multiples of 600. As all of the special switch sockets in the space belonging to one substation are in the same strip and close to each other, the operator has, by this method of connection, all the means of connection with a substation in a condensed space, and can proceed with her work with a confidence and make the tests and connection in the easiest and most expeditious manner.

No. 667,546.—LEMUEL MELLETT; dated February 5, 1901.

This invention relates to telephonic transmitters, and its object is to increase the delicacy or responsiveness of such

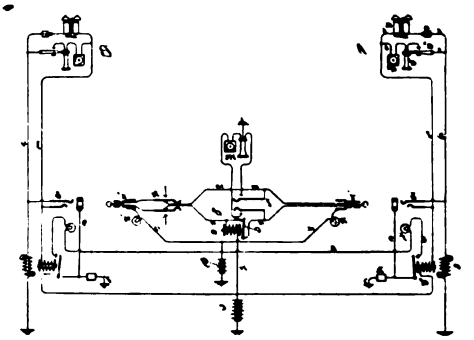


No. 667,546.

instruments. This object is attained by employing, in connection with a sound-affected, resistance-varying element, such as the granular-carbon cell commonly employed in transmitters, a series of vibrators which are responsive by the phenomena known as "consonance" or "sympathetic vibration" to different sound tones and which react upon the resistance-varying element in such manner as to increase its sensitiveness to the original sounds produced. The accompanying drawings represent a medium section taken from front to rear thru a transmitter constructed in accordance with the invention.

No. 667,463.—CHARLES E. SCRIBNER; dated February 5, 1901.

This invention applies to telephone lines equipped with supervisory signals in a switchboard. Its purpose is to

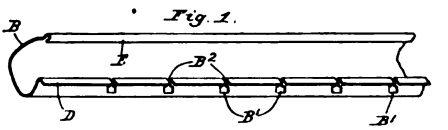


No. 667,463.

cause the supervisory signals of two united lines to act independently at certain stages during the connection between the lines and jointly at other times.

No. 667,195.—THOMAS VIVIAN DAVIS; dated February 5, 1901.

This device is intended to be used in connecting a cable to the point of distribution. It provides for its shell to be



No. 667,195.

insulated and provided with slots for the distinct wires to pass thru at the immediate point of connection with the board.

No. 667,674.—IRVING S. HOFFMANN; dated January 29, 1901.

This invention consists of a telephone directory holder. It is very simple and inexpensive in construction. It is

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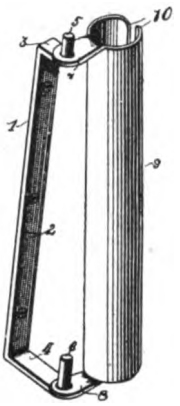
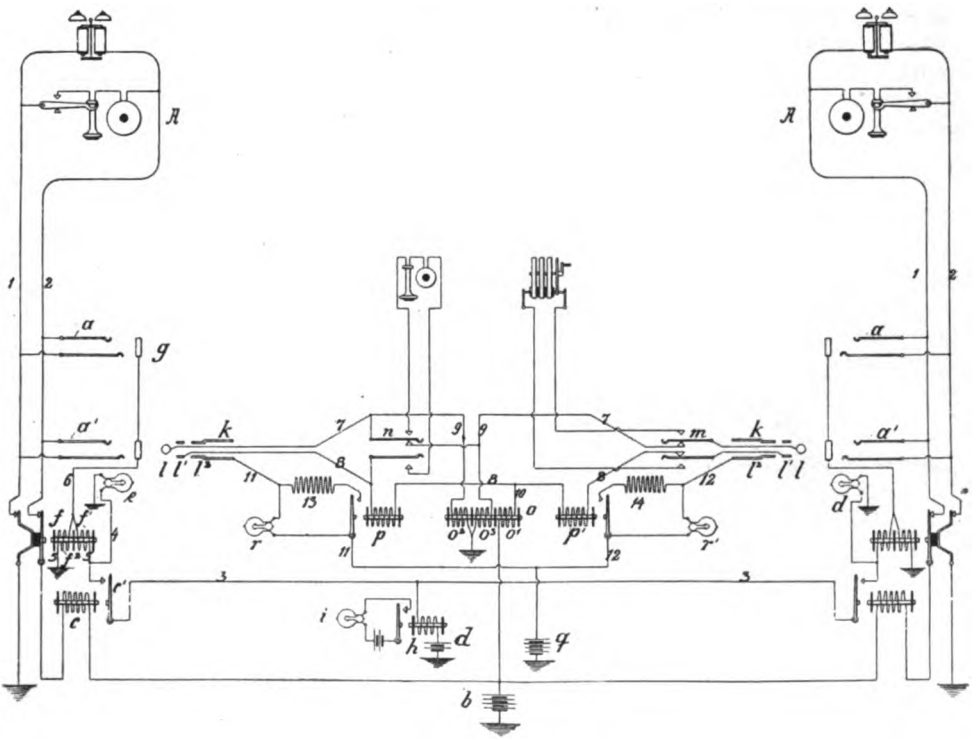
adapted to readily receive a telephone directory, and it will permit the same to be inspected without removing it from the bracket, and it may be taken down when desired. It is also arranged so that when not in use it remains flat against the wall, out of the way.



No. 667,674.

No. 667,461.—CHARLES E. SCRIBNER; dated February 5, 1901.

This invention concerns the mechanism associated with telephone lines in a switchboard for signaling to the attendant and indicating the use or disuse of the appliances at the stations. In the specific form of the invention which is illustrated, the cut-off relay is provided with differentially wound helices, which are serially connected and constitute the shunt about the line lamp. The point of junction of these helices is united with a contact-piece in the spring jack or terminal socket of the line, with which a suitable contact of the connecting plug registers, the contact portion of the plug, including the supervisory signal, together with a source of current. A relay in the plug circuit controls the supervisory signal by closing about the supervisory lamp a shunt having a resistance nearly equal to that of the lamp when the relay is excited. The electromagnet controlling the night signal is a magnet of very low resistance interposed in the circuit of several line lamps and constructed to close a local circuit, including a general signal lamp or any suitable alarm. The subscriber's act of calling causes the line relay of the corresponding line to close the local circuit thru the line lamp. If this lamp be not broken, the line lamp and the general signal lamp, controlled by the relay in the local circuit with the line lamp, will light simultaneously. If, however, the circuit thru the line lamp be interrupted, the general lamp alone will light, which



No. 667,461.

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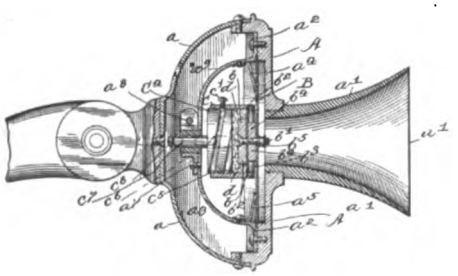
will call the attention of the operator to the defective condition of the line lamp. Also, if an operator should make connection with a line called for, the supervisory signal corresponding to the plug used in making the connection should become illuminated under normal circumstances, there being no current thru the relay controlling the supervisory signal, the local circuit of the signal being complete and of normal resistance thru the line lamp. In this case the interruption of the circuit thru the latter lamp would be signified by the dimming of the supervisory signal at a time when it should be bright. The connection of the differential windings of the cut-off relay with the special contact-pieces in the spring jack, which are customarily adapted for testing in multiple switchboards, has the incidental advantage of causing the initial act of the subscriber in removing his telephone from the switch in order to procure a connection to alter the electrical condition of the test rings, and thus to make the line test busy.

The attached drawing is a diagram of the circuits of this invention. It represents two stations connected by telephone lines with switching and signaling mechanism in the switchboard.

No. 667,327.—TIODOLF LIDBERG; dated February 5, 1901.

The object of this invention is to construct a transmitter cheaply and one easily and quickly assembled and with a wide variation of adjustment after the instrument has been assembled and is

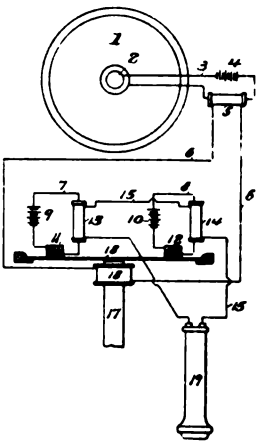


No. 667,327.

being tested. Also to produce a transmitter wherein the granules of carbon are positively and effectively confined within a given space, as is shown in the drawing, and whereby the space within which said granules are confined is readily adjustable, so that the instrument may be adjusted after being placed in position without the necessity, expense and inconvenience of providing separate and distinct sizes or portions of the granular carbon, for the purpose of increasing or diminishing the space when required, as has always been the case in transmitters of this description.

No. 666,675.—GEORGE L. HOGAN; dated January 29, 1901.

This device is intended for use in long-distance telephony, which will operate in the same manner as a relay



No. 666,675.

operates in telegraphy, and by the use of which the secondary current on the line wire can be greatly increased from point to point where necessary, so as to render it possible to transmit messages with ease over great distances.

A full understanding of the improvements constituting the present invention can best be given by an illustration.

No. 667,503.—ALLAN B. CLARK; dated February 5, 1901.

This invention relates to connecting a phonograph to a telephone. Of course, there is nothing new or novel in this, but the idea of placing the phonograph at the central station, to be switched in with any subscriber as desired, and to be connected to any other one at any time for the purpose of repeating adver-

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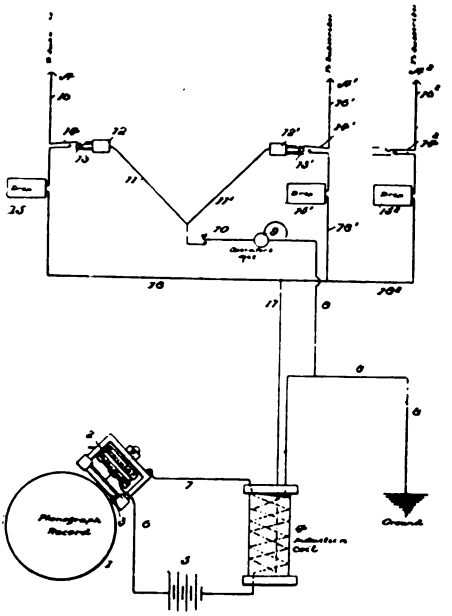
tisements, messages, news or any other matter to different subscribers, without interfering with the conversation be-

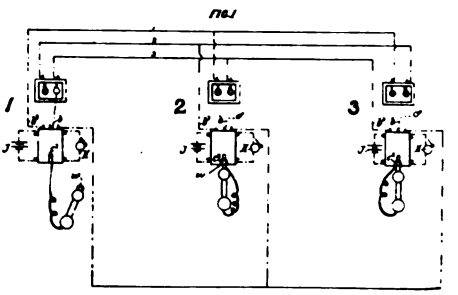


No. 667,503.

tween subscribers or the operation of the operator at the central station, brings it into the class of an invention.

No. 666,874.—PARNELL RABBIDGE; dated January 29, 1901.

This invention has been devised for use in connection with private and domestic systems of telephonic intercommunication. The special feature of the device consists in the employment of a particular form of switching appliance that is introduced into the circuit between the connecting switchboard and the instrument. In Figs. 2 and 3 *a* is a box or cover in which is contained the switching appliances; these switching appliances consist of four springs—metal—connecting pieces *bb*, *b2*, *b3*, secured to the box. Behind these connected pieces and impinging against them are two studs *cc* which are connected to a sliding block *c* which slides up and down a groove *c* in the front of the box. To the front of the sliding block is attached a hook or knob c^2. By sliding the block up and down in its groove, the studs *cc* may be brought respectively into contact with either of the connecting pieces, *b* and *bb* and b^3, or b^2 and b^3. The stud *c* is connected thru the wire *d* with one pole of the battery *j*, used for working the telephone. The other stud *c* is connected thru the wire *d* with the telephonic instrument. The four connecting pieces *bb*, b^2, b^3, are connected by means of

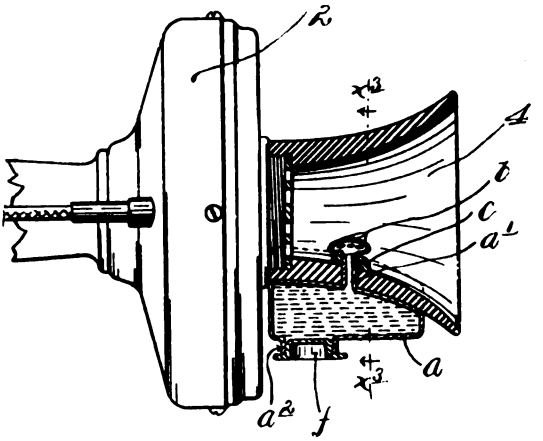


No. 666,874.

the wires *b*, *b*, b^2, b^3, respectively, as follows: *b* is connected with a line selector plug; *b* with earth, b^2 with earth; and b^3 with a home line wire.

No. 666,199.—ADOLPH B. LARSEN; dated January 15, 1901.

This is another germicide device for telephone transmitters. As is shown in the drawing, the mouthpiece is provided with a well and means for filling the same. There is a hole bored thru the



No. 666,199.

mouthpiece into the well; the top of this is provided with a very fine nozzle, so that when the well is filled with the

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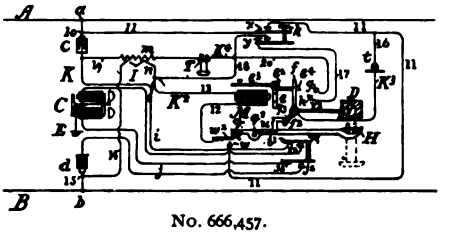
germicide, either in liquid or solid form, of a nature that will evaporate, and fill the mouthpiece with fumes which will destroy all germs.

No. 666,457.—JOHN A. BARRETT; dated January 22, 1901.

This invention consists of a positive locking-out device for toll-line service. The call-bell at each station may be of any desired character. Selected bells of

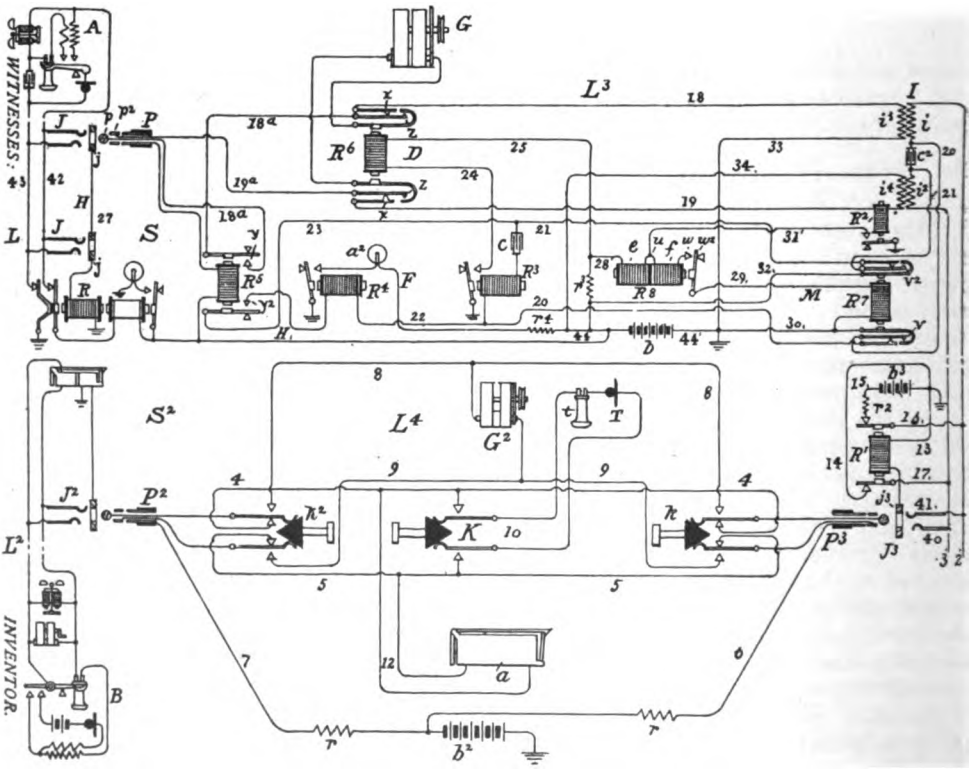


No. 666,457.

that class adopted by a special arrangement of call lines to respond respectively to currents transmitted over either line conductors to earth, to currents transmitted over either line to return by the other, and to currents transmitted over the two line conductors in parallel to earth as described in patent No. 626,131, granted to Mr. Barrett. The electrical arrangement of these parts is shown in the diagram. It is readily seen in this device that it is impossible for more than two parties to talk at a time.

No. 666,698.—MALCOLM C. RORTY; dated January 29, 1901.

This invention accomplishes several things; first, to enable both sub-stations of two united by a trunk line, even tho one of them be provided with automatic calling devices, and the other with ordinary magneto signals to operate one and the same supervisory or disconnecting signal placed at one end of said trunk; second, to enable the withdrawal of a switch plug at one end of the trunk line in obedience to the said supervisory signal, and as the initial step in the disestablishment of the thru communication circuit, to automatically



No. 666,698.

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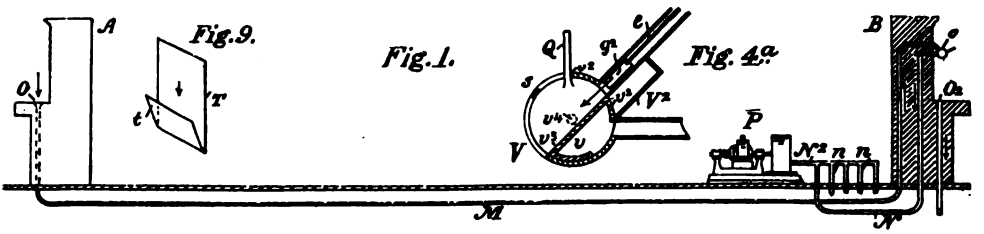
operate a signal upon the switchboard of the other end of said trunk, whereby the operator there may be notified to take further action necessary to complete disestablishment; and, third, in combination with the trunk line and its accessories adapted to the attainment of the first and second objects. To enable an operator located at one end of the trunk line, whereby thoro communication is to be established between two sub-stations circuits connecting with the different switchboards to signal the sub-station of the circuit united to the other or distant end of the trunk line. L represents the circuit of a sub-station *a*, extends to a sub-station *s*, and is built on the central battery plan; it has



No. 666,444.

branch terminals, jacks *j*, provided with test rings connected to one another, thru a cut-off relay *r* to the ground. L^2 represents a sub-station circuit of the older type extending from sub-station *b*. It is provided with local transmitter battery and a bridge call generator to central station s^2 where it has an annunciator and the usual terminal socket j^2. This sub-station, circuit L^2, may or may not pass thru an intermediate central station. The entire lower portion of the drawing represents the toll station or central station s^2 to which the sub-station line L^2 and a sufficient number of trunk lines entering from other central stations converge.

No. 666,444.— GEORGE KNOX THOMPSON AND ERNEST CLIFTON ROBES; dated January 22, 1901.

In telephone exchange traffic, messages of a certain class are known as "toll" messages. In general these are messages between sub-stations of different exchanges or between widely separated exchange districts, and the lines over which they pass between exchanges are called "toll lines." They require special attention and care on the part of the operating force of the central station or the several central stations concerned, and for these messages a special charge is made. The invention is especially well adapted for use in association with these toll lines. These conditions render it necessary that the names and telephone numbers of the call-originating and called-for sub-stations, together with information as to the date, the time of day, and the time consumed in the exchange of conversation or the transmission of the message, shall be entered on a blank form termed the "ticket." This is done, first, to avoid the confusion and liability to error, which, as experience shows, is apt to occur if the above-recited information be transmitted orally between the several operators, and, second, to furnish a record of the transaction for future reference.

It is furthermore desirable that after the conversations are completed, and their duration properly recorded on the tickets or slips, the ticket shall be forwarded to some central point — a clearing-house, so to speak. It has been customary to distribute and collect the tickets by messengers. This invention provides to dispense with messengers, and substitute a serviceable apparatus for the noiseless, accurate and swift conveyance of the tickets. The invention is a system of pneumatic tube transmission extending from switchboard and between switchboards, for the transmission of said tickets. It is shown in detail in the drawing.

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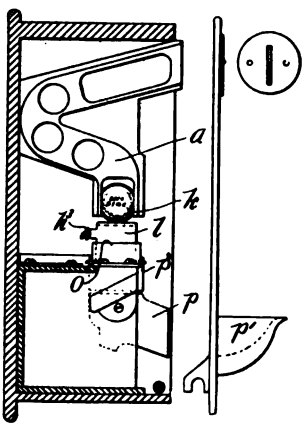
No. 665,874.—ALBERT M. BULLARD; dated January 15, 1901.

Telephone toll-station devices of the class requiring the deposit of a coin at the subscriber's station before the central office can be signaled, ordinarily have two functions, namely, to drop the coin into the cash-box or to return it to the outside of the box, the disposal of the coin usually depending upon whether or not the desired telephonic connection can be obtained. Heretofore in devices of this character the telephone operator has complete control of only one of these two functions, usually that of putting money in the cash-box. To perform the other function the coöperation of the subscriber must be had. In



No. 665,874.

most of the previous devices where the toll-box has been provided with the return-coin feature it was always necessary for the subscriber to perform some function, that is, either hang up his receiver or press the button. With this device it is done away with. There is a polarized magnet which, at the will of the operator at the switchboard, can be made to move either to the right or the left, as is shown in the drawing. A movement to the left deposits the coin in the box, and a move to the right returns the coin to the subscriber, this device being entirely at the will of the operator.

THE TELEPHONE MAGAZINE is my telephone guide, for I would be lost without it. J. W. WOODS.

RESUMPTION OF THE GILLILAND COMPANY.

The Gilliland Electric Company, Adrian, Michigan, has resumed, on a large scale, the manufacture of telephone and electrical specialties. The Gilliland Company, which was organized in 1887, for many years manufactured all the pins and brackets for the largest telephone and telegraph companies in the United States.

Mr. James F. Gilliland, the manager of the company, is one of the best 'phone men in the telephone business. He comes of a family of well-known telephone men, and himself has invented and patented large numbers of electrical and telephone devices.

The Gilliland Company has installed complete wood and metal working machinery and is prepared to furnish at the lowest market prices all forms of cabinet work, pins and brackets, and is also equipped to manufacture many articles which ordinary manufacturers could not handle at a reasonable price.

The Gilliland Company, which was organized fifteen years ago, has made for itself an enviable reputation for high-class goods, and respectfully solicits correspondence with any one interested. Its plant, with the capacity for one thousand men, enables it to fill all orders with promptness, and its favorable situation gives it exceptional advantages with regard to the cost of manufacture. Every article manufactured by the Gilliland Company will be of the highest grade of quality and absolutely guaranteed.

A PROSPEROUS INSTITUTION.

The stockholders of the Saline County Telephone Company held their annual meeting in Harrisburg, Illinois, and elected officers as follows: Dr. M. D. Empson, president; G. H. Mitchell, vice-president; C. V. Parker, secretary and general manager; T. E. Webber, treasurer. A fifteen per cent dividend on the capital stock of $10,500 was declared. The company now owns sixty miles of toll lines in the county, with exchanges at Harrisburg, Eldorado and Galatia.

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EXCHANGE EQUIPMENT OF LEHIGH TELEPHONE COMPANY, OF ALLENTOWN, PENNSYLVANIA.

The Lehigh Telephone Company, of Allentown, Pennsylvania, has for the past year operated an Independent telephone system, with apparatus furnished and installed by the American Electric Telephone Company, of Chicago. The Lehigh Telephone Company was incorporated September 13, 1899, with Thomas Dougherty as president; Wilson J. Hartzell, vice-president; F. S. Hersch, treasurer; Fred E. Lewis, secretary, and F. A. Demarest, manager. The outside construction work was begun January 3, and the work was carried forward at so rapid a rate as to permit of the first instruments being installed about April 1, at which time Mr. Demarest had already placed eight hundred poles thruout the city of Allentown, thirty of which were 70-foot distributing poles with 32-pin distributing rings. The system is further equipped with twelve 100-pair aërial cables, these being divided into 15-pair or 25-pair cables for entering into the different distributing boxes. Another cable of 75-pair was run about five miles to Catasauqua, an adjoining town. Before all of this work had been done, however, the Lehigh Telephone Company, thru its engineer and manager, Mr. Demarest, made a very careful test of all apparatus submitted for use in connection with the exchange equipment. The result of this test was that the American Electric Telephone Company was awarded the contract for supplying the entire equipment of telephones, switchboards, terminal heads, powerboard, etc. The switchboard selected was of the magneto-call type, with electric-light clearing-out signals; and, as shown by Fig. 1, the board selected is of the multiple type, having an ultimate capacity for three thousand subscribers' lines.

Fig. 2 gives a partial back view of the switchboard, while Fig. 3 shows a view

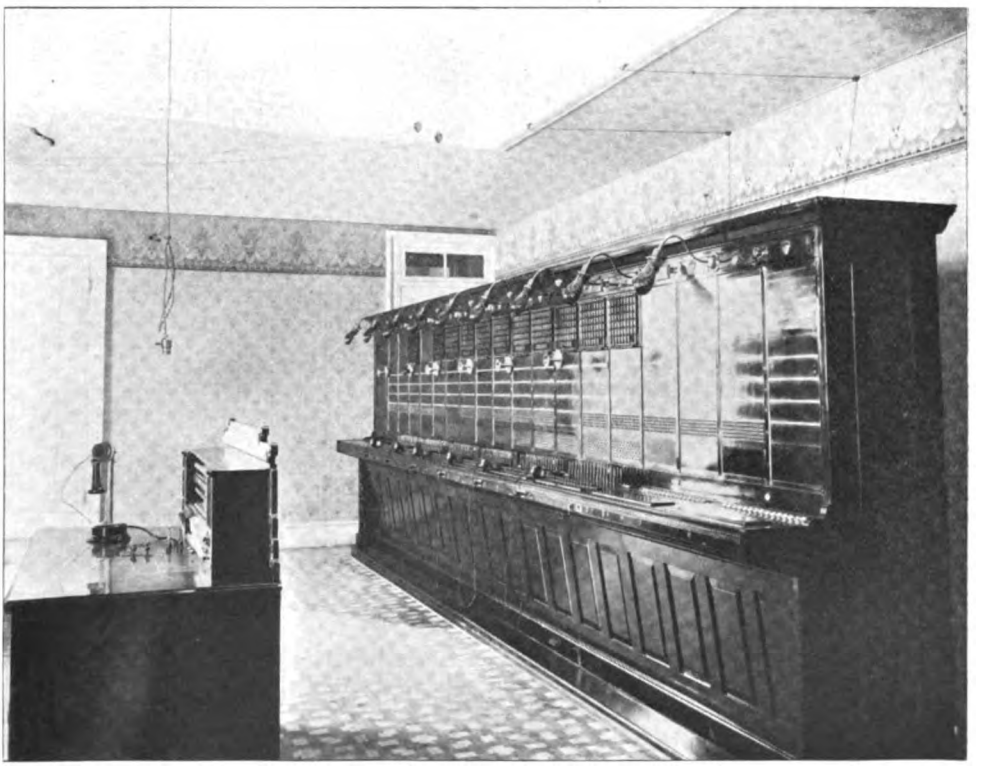

FIG. 1.

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of the terminal board and Fig. 4 a view of the power switchboard, together with the combined battery charging and telephone bell-ringing machines.

The telephones were especially built according to specifications drawn by the

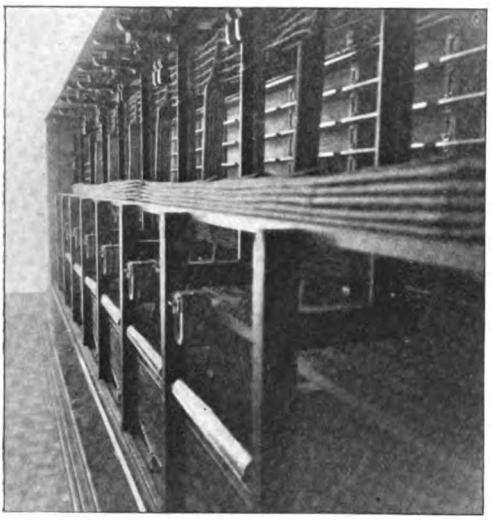

FIG. 2.

Lehigh Company's engineer, and the instruments are built with the special object in view for giving service to three, five or more subscribers connected upon one circuit. As a matter of fact, there are only about one hundred and fifty exclusive lines used thruout the city, the balance being three and five party lines, the following rates prevailing:

Five party lines, business $18, residence $12.
Three party lines, business $24, residence $18.
Exclusive lines, business $36, residence $24.

When the Lehigh Telephone Company began doing business it purchased an entire building for its headquarters, the operating-room occupying the front of the second floor, the distributing-room and power-room occupying the rear, while the directors' room, offices and workrooms are located upon the first floor.

The cables enter the building underground thru conduits and are distributed to the well-known Burns type combined sneak-current and carbon lightning-arrester terminal. The cross-connecting board, as shown in Fig. 4, consists of an iron frame to which are fastened hard rubber strips holding in place double-end connectors, and as shown by the figure, the distributing board cables are connected to the terminal heads overhead. The switchboard cables pass down in under the floor and terminate at the main switchboard in the bottom of the intermediate distributing board, as shown by Fig. 2. These cables, after being connected across to the terminals on the intermediate board, pass thru the multiple cable in regular order. Referring to Fig. 2, it will be observed that immediately above the intermediate distributing board are mounted the lamp signal relays, while above the relays we have the hand generators and the cord-connecting rack. A little further up it will be observed that the multiple cables are placed upon a substantial supporting framework; then clear up under the top of the switchboard we have the induction coils, as also the line signals, together with their connecting cables. The front of the switchboard and chief operator's desk are shown by Fig. 1. The switchboard is built from the finest grade of

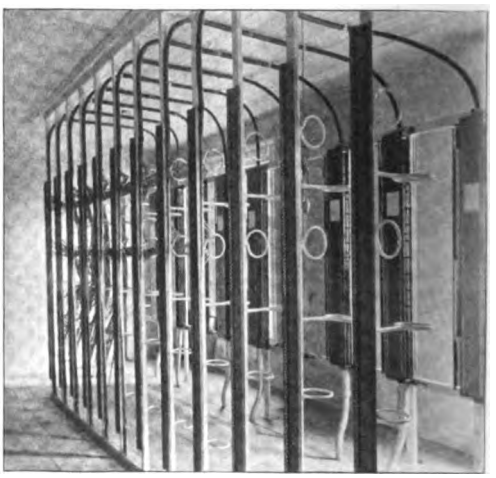

FIG. 3.

selected mahogany, with a special process rubbed finish. As will be observed, the spaces provided for additional multiple jacks are closed by removable panels, these panels being separated by white holly-faced parting strips. It will

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further be observed that the combined ringing and listening keys are mounted upon a key table, which may be swung up and thus permit of ready access to the circuit changing keys, for the purpose of inspection or repairs. Behind the keys, it will be noted, the connecting cords are placed, and behind these we have the electric-light supervisory clearing-out signal. The small lamp fronts shown above the clearing-out signals are used for pilot signals, these signals lighting up whenever a shutter falls, and thus indicating an incoming call signal.

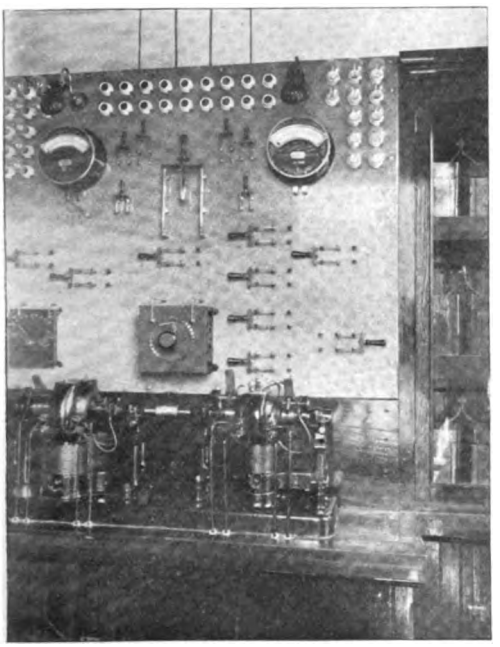

FIG. 4.

The chief operator's equipment, shown to the left of Fig. 1, is equipped with a complete system of electric-light signals, listening-in keys and trunking circuits, etc., for permitting the chief operator to have complete control over the operators.

Fig. 3 gives us a view of the power-board and charging machines, as also a partial view of the storage batteries. At the top and sides of the switchboard, it will be observed that we have a series of resistance lamps, these lamps being so connected that when an operator at the main switchboard signals out over a circuit, the signaling current must pass thru both lamps in series — that is, when signaling is done on direct circuits; but when party-line bells are required to be operated, a pulsating current is used and permitted to pass thru only one of the lamps, this being done in order to accommodate the design of the ringing generator, which delivered 80 volts on the alternating and only 40 volts from the pulsating current windings.

The powerboard is also equipped with a voltmeter and ammeter, as shown. The large center switch is used for the purpose of cutting the main supply current off the driving motor. In addition to the above, the powerboard is equipped with all necessary switches for permitting of making the usual combinations in charging, discharging or otherwise controlling the system of current supply. The dynamotor consists of two Crocker-Wheeler machines, one a 1½-horse-power 500-volt motor, provided with a separate winding for furnishing the power for ringing purposes, which is an alternating one, and which by a suitable system of commutation is transformed into a pulsating current. Then connected to this machine by means of a slip coupling we have a compound dynamo, one winding giving 20 amperes at 10 volts and another winding delivering 10 amperes at 5 volts, both of these windings being used for charging storage batteries.

At the present time, the Lehigh Telephone Company has about eleven hundred telephones connected to its switchboard, and additional subscribers are being cut in every day. The prospects look exceedingly bright for the new company, which is building a number of toll lines and at present has lines to the following places: Slatington, Cherryville, Macungie, Emaus, Dorseyville, Wescoville, Kutztown, Cementon, Coplay, Egypt, Rittersville, and a large number of intermediate points. The Lehigh Telephone Company's construction work and equipment is first-class in every particular, and with its proposed extensions will make one of the strongest Independent companies in the country.

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EUREKA ELECTRIC COMPANY.

The Eureka Electric Company, having just located in its new factory at 143-145 South Clinton street, Chicago, is just preparing to place upon the market and add to its already large line of telephonic exchange appliances some special and interesting apparatus containing special features and points of

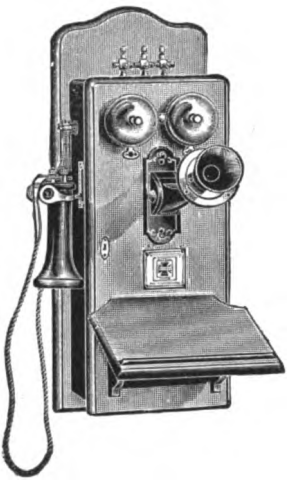

FIG. 1.

merit not found in any of its competitors' apparatus.

A few cuts shown herewith will more clearly convey to the reader a better idea of the company's later apparatus.

Fig. 1 shows its latest condensed type of telephone — No. 97. This instrument is built for

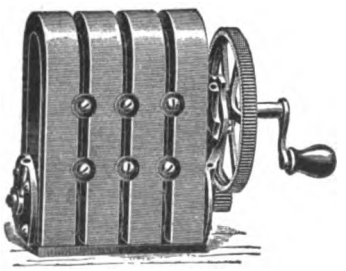

FIG. 2.

either central energy work or magneto systems. Where the instrument is built for magneto work the generator shown in Fig. 2 is employed. This machine has an extra heavy quantity output and in every case is to be found efficient and reliable. The general specifications of the generator are of the highest grade of tungsten steel, which fact is sufficient

FIG. 3.

endorsement of the merit and quality of the generator, and at the same time the buyer is assured of a machine that will retain its magnetism and be in every way as efficient and reliable after years of service as when purchased.

A general inside view of the receiver is shown in Fig. 3. The same quality of magnet steel is used in the permanent

FIG. 4.

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magnet of the receiver as is mentioned above in the generator. These magnets are capable of lifting easily a 2-pound weight, and the cut shown in Fig. 4 will give a general idea of the strength of the magnets and other special features of the receiver, the company furnishing either its No. 18, No. 19 or new No. 20 on any of its different types of telephones at the request of the purchaser. All of these three receivers contain special points of merit and will be found in every way superior instruments.

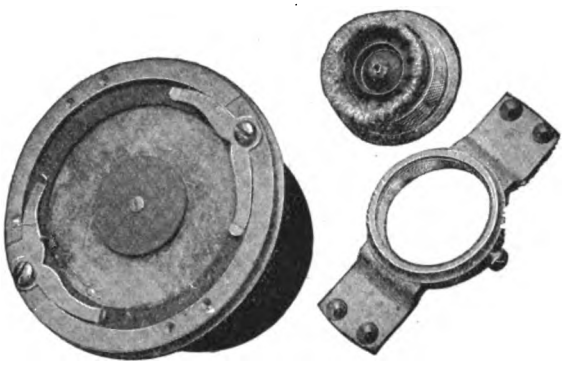

FIG. 5.

The transmitter employed and furnished on all of the Eureka Company's well-known telephones is that as shown in Fig. 5. This instrument is in resistance the highest of any telephone transmitter on the market; has a resistance of 80 ohms. Its special features are its special construction and its adjustability, it being the only adjustable transmitter in the Independent field. A correct view of the construction can be observed from the cut.

The fact that this transmitter is in resistance the highest of any on the market in the Independent field makes it specially adaptable for service in central energy systems and for magnetic work with local battery at the instruments, it being so high in resistance the consumption of battery power is very nominal, which means an economical instrument in service and superior results under a very high battery power, as the transmitter is capable of standing anywhere from 6 to 10 cells where the line resistance is very high, caused either by bad joints and other matters of poor construction, or where it be desired to get excellent results without the instrument taking any local noises.

FIG. 6.

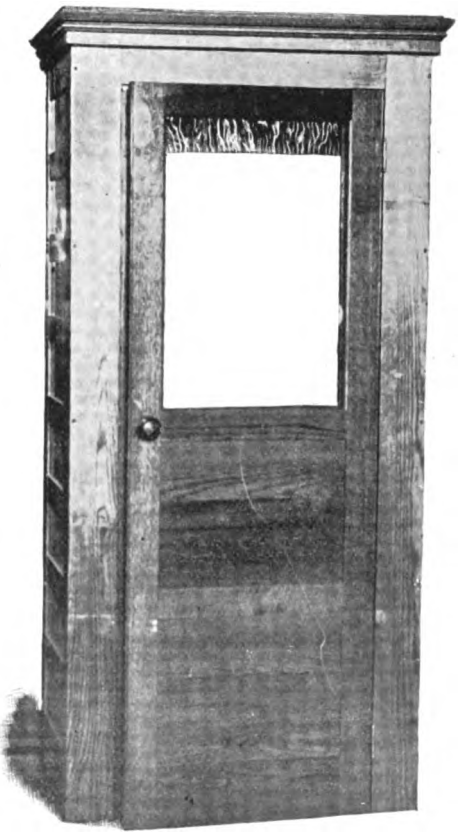

FIG. 7.

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The company will be pleased to forward a sample transmitter for comparison and test to any company interested or looking for an efficient and satisfactory article and an instrument possessing superior merit over anything they may be using.

Fig. 6 shows the Eureka Company's lineman's test set, an instrument which it is putting out to a very heavy extent, and an instrument that is giving very fine satisfaction.

The company manufactures quite an extensive line of apparatus and in its

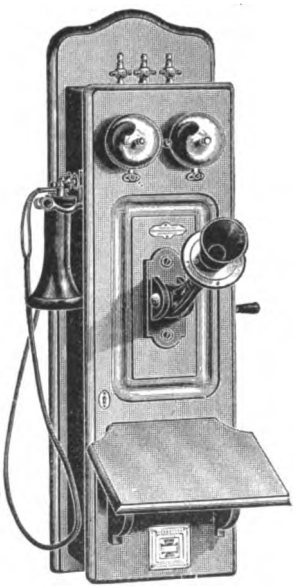

FIG. 8.

new quarters will be in a better position to turn out goods than ever before.

Fig. 7 shows the pay-station telephone booth which the company carries in stock, can ship promptly, and quotes extremely low prices on same. These booths are double-doored and are shipped knocked down.

At the present time the company is perfecting and improving its line of apparatus thruout to its entire extent and the company would kindly ask the same patronage at its new quarters from its old-time friends as was bestowed on it in its old.

The company will be pleased to quote on anything in its line and is now building its multiple switchboard, which possesses special points of merit not contained in any of its competitors' multiple boards. Full particulars and specifications on the same the company will be pleased to furnish to any one desiring.

SOLDERING CAST IRON.

The difficulty of successfully brazing cast iron is due to the carbon in the cast iron, which exists in the form of particles of graphite, preventing the adhesion of the spelter, just as a coating of dust prevents the adhesion of cement to brick or stone. If the graphite layer could be removed before starting brazing, there seems to be no reason why cast iron can not be brazed as well as wrought iron, and a process for accomplishing this result has been patented in Germany, consisting essentially in applying to the surfaces to be united an oxide of copper and protecting them against the influence of the air with borax or silicate of soda. When the joint is heated the oxide of copper gives up its oxygen to the graphite, converting it into carbonate oxide gas, which escapes in bubbles, while particles of metallic copper are deposited on the iron. Any oxide of iron which may be formed is dissolved by the borax, and the surfaces of the iron, thus freed from graphite, unite readily with the spelter which is run into the joint before it cools, the copper already deposited on the iron assisting the process. The inventor claims the cast iron can in this way be readily brazed in an ordinary blacksmith's forge.

FENCE LINES IN AUSTRALIA.

The long wire fences which many Australian herd owners have been compelled to make to protect their lands from the rabbits, are now used to a great extent as telephone conductors by which the neighbors communicate with each other. In many cases the distance covered is as great as fourteen miles. Altho the wires are somewhat defectively insulated, they perform their function in an excellent manner.

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TELEPHONE NEWS.

ILLINOIS.

BARRY, ILL.—A deal was completed whereby the control of the Farmers' and Merchants' Telephone Company passed over to the Central Union Telephone Company, which will hereafter operate it.

STREATOR, ILL.—There are 237 Northern Illinois telephones in Streator. In Galesburg the ordinance has been passed after the most bitter opposition by the old company. In Joliet a Northern Illinois line is being constructed and a franchise has been granted in Batavia.

METROPOLIS, ILL.—Ordinance No. 195, repealing the ordinance granting a franchise to the Cumberland Telephone & Telegraph Company, became a law Monday night, when the council adjourned. The mayor having failed to veto the repealing ordinance, it became a law without his signature.

LOCKPORT, ILL.—The Northwestern Telephone Company has filed a trust deed for $500,000, covering its Aurora, Joliet and other telephone exchanges, etc.

KEWANEE, ILL.—The Central Union Telephone Company has agreed to a reduction of rates at Kewanee, and the application for a franchise for an Independent company has been withdrawn. By the new agreement, a residence rate of $1 a month and a business rate of $1.75 a month are made, though the company specifies that it may be a six-party service. Seven free 'phones are given the city and an elaborate scheme of farmers' telephone service is arranged.

OQUAWKA, ILL.—The Henderson County Telephone lines have been sold to Mr. H. B. Scovers, of Carthage. Four of the old directors will remain, as follows: R. F. Robinson, Milt Robinson, H. B. Safford and James Moir. The head office will continue at Stronghurst.

KEITHSBURG, ILL.—The Tom A. Marshall Telephone Company, of Keithsburg, has been incorporated, and will offer a limited number of shares to residents of the towns reached by the system, in order to enlist their interest and influence. The company now owns between seven and eight hundred miles of telephone lines in Warren, Mercer, Henderson and neighboring counties, but it is the purpose to further extend the lines and make all of them metallic circuit. One of the new points to be reached is Muscatine, Iowa, and a cable will be laid under the Mississippi river for that purpose.

ALTONA, ILL.—J. A. Tomquist will establish a telephone exchange here to connect with the lines of the Nekoma-Altona Company.

MENDON, ILL.—Mendon will soon be the center of a system of farm telephone lines radiating in all directions. The Mendon & Paloma Mutual Company was organized. The officers are: L. A. Johnson, president; William Taylor, vice-president; Dr. Collins, secretary; Elmer Morton, treasurer.

SALEM, ILL.—A local telephone exchange will be established in Sandoval by ex-Senator Charles E. Hull, of Salem. It will be operated in connection with his other lines in Marion county.

POLO, ILL.—The Ogle County Telephone Company will put in an exchange at Polo in the spring. Work is to commence just as soon as the ground is in shape, on a full metallic system. All subscribers of the Ogle County Telephone Company will have free service to all the towns and cities in twelve counties in northern Illinois, including Dixon with about 350 subscribers, Rochelle with about 300 subscribers, Oregon with about 175 subscribers, Sterling with about 350 subscribers, and all the surrounding towns and cities. At Polo they get a $12 and $18 rate.

CHICAGO, ILL.—Chicago Telephone Supply Company, Chicago; capital stock, $25,000; manufacturing telephones and supplies; incorporators, George A. Briggs, Henry L. Briggs, Blanche W. Briggs.

MANITO, ILL.—The Pekin Telephone Company will install a local service.

WILMINGTON, ILL.—The Northwestern Telephone Company secured a franchise from the city council of Wilmington.

GRIGGSVILLE, ILL.—A. N. Orr, of Perry, has been granted a franchise to put in a telephone exchange at Griggsville.

CHICAGO, ILL.—Incorporated: American Telephone Company, Chicago; capital stock, $2,500; manufacturing telephones and electrical supplies; incorporators, Henry J. Anderson, Harvey Wright, Charles B. Stafford.

QUINCY, ILL.—The Central Union Telephone Company has purchased the Farmers' and Merchants' Telephone Company, whose line runs from here to Pittsfield. The line is seventy-five miles long, and by it Quincy has connection with Burton, Newtown, Liberty, Richfield, Kingston, Beverly, Hadley, Barry, El Dara, New Canton and Pittsfield.

AURORA, ILL.—The Northwestern Telephone Company has filed a mortgage for $500,000 at Geneva and Joliet to protect its bond issue. This is one of the largest mortgages ever filed in the county.

AVON, ILL.—The village has granted a telephone franchise to the Farmers' and Merchants' Telephone Company.

SAUNEMIN, ILL.—A farmers' telephone company has been organized, with H. G. Norman, president; W. H. Hull, secretary, and M. B. Jones, treasurer.

BIG ROCK, ILL.—The Northwestern Telephone Company has purchased the telephone business in Big Rock from the Northern Illinois Company. The Northwestern will de-

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velop the plant the same as the lines at Kaneville and Sugar Grove, and expects to have fifty more farmers as subscribers inside of a few weeks.

ROCHELLE, ILL.—Ogle County Telephone Company, Rochelle; capital stock increased from $10,000 to $50,000.

LONGVIEW, ILL.—The Pleasant Hill Telephone Company, of Raymond township, has been organized, with Theo Block, president; E. F. Block, secretary. The line will run from Longview to Sidney, with a fair prospect of connecting with Philo.

PALOMA, ILL.—The telephone line from Paloma to Mendon is known as the North Star Telephone Line, and they have elected the following officers: President, L. A. Johnson; vice-president, William Taylor; secretary, Dr. H. O. Collins; treasurer, Elmer Morton.

WISCONSIN.

MARSHFIELD, WIS.—The Loyal-Marshfield Telephone Company shares are way up above par. Its stock has paid big dividends from the start. A dividend of twenty per cent was declared.

SOUTH MILWAUKEE, WIS.—George Lorig, William J. Sutton and Frederick J. Koch have filed with the register of deeds articles of incorporation of the Southwestern Telephone Company, the capital stock being placed at $5,000.

PLYMOUTH, WIS.—The Plymouth Telephone Exchange elected officers: President, C. Pfister; vice-president, P. W. Rowe; secretary, C. D. Eastman; treasurer, H. W. Hostman.

OSSEO, WIS.—The Osseo Telephone Company voted to extend lines to Mondovi and Eau Claire.

CHIPPEWA FALLS, WIS.—The O. J. Jenson Telephone Company, which owns and operates a telephone system from Cadott to Estella, in this county, has been granted franchises to place exchanges at Boyd and Stanley. Other towns along the line of the Wisconsin Central Railway are considering the matter of granting franchises.

BELMONT, WIS.—The village board of Belmont granted the Farmers' Telephone Company the right to erect telephone poles inside the corporate limits of the village.

RIO, WIS.—The incorporation of the People's Telephone Company was completed at a meeting of the stockholders. All lines, telephones, exchanges, franchises, etc., of J. L. Farrington were purchased by the company. J. L. Farrington was elected president and manager; J. F. Robertson, vice-president, and E. E. Marsh secretary and treasurer.

APPLETON, WIS.—Telephone ordinance to grant a franchise for a telephone system in Appleton City to W. D. McComb, passed by a unanimous vote of the members of the board present. The ordinance was then ordered published, calling a special election to vote on the proposition.

INDEPENDENCE, WIS.—The Trempealeau & Buffalo County Telephone Company was organized, with the following officers: President, C. H. Cooke; secretary, Ed Jackson; treasurer, Ole Pederson; manager, A. J. Bautch. The line will run from Independence to Russell, Lookout, Gilmanton and Theisen postoffice. The line is to be completed and in operation by June 1. The poles are now being delivered along the line.

WATERLOO, WIS.—The Roach & Seeber Company has sold its telephone exchange to the North & East Bristol Telephone Company.

MICHIGAN.

BUNKER HILL, MICH.—The telephone line known as the North Fitchburg & Bunker Hill Telephone Line was organized, with the following officers: President, James Brogan; secretary, C. A. Clinton; treasurer, Fred Lord.

WEST SUPERIOR, MICH.—The People's Telephone Company, which has seven hundred 'phones in service at West Superior and sixteen hundred at Duluth, and has its lines as far east as Iron River, proposes to extend its system to Ashland early in the spring, and then build thru to the range towns.

MOUNT CLEMENS, MICH.—The Macomb County Telephone Company elected the following officers: President, G. R. Lovejoy; vice-president, J. A. Heath, Richmond; secretary, S. B. Spier; treasurer, A. A. Ameis; executive committee, Messrs. Lovejoy, Spier and Ameis.

BURR OAK, MICH.—Incorporated: The A. C. Himebaugh Telephone Company, Burr Oak, Michigan; capital stock, $5,000.

OHIO.

LINNVILLE, OHIO.—Manager Walton, of the Stark County Telephone Company, and Director R. S. Shields, secured a franchise for the operation of a local exchange, to be placed in operation by the Stark Company. The work of construction in the numerous towns in this vicinity, franchises in which have already been secured by this company, will be in progress at the same time that the work is being pushed in Canton.

RIPLEY, OHIO.—A franchise was granted to the Independent Telephone Company to erect poles and operate a telephone line in Ripley. Representatives of the company were present from Batavia and Delaware, Ohio. Ripley already has the Central Union Telephone Company.

COLUMBUS, OHIO.—Incorporated: The Ohio Construction and Finance Company, Cleveland; capital stock, $10,000.

GREENWICH, OHIO.—A new telephone company has just been incorporated. It is known as the Tri-county Telephone Company, and the incorporators are all Huron county men, as follows: A. K. McConnell, D. J. C. Arnold, H. A. Van Epps and H. W. Townsend, of New London, and H. J. Washburn and J. Cleland, of Greenwich.

WEST UNITY, OHIO.—The Citizens' Telephone Company has been organized to install a local exchange. Capital stock, $15,000.

AKRON, OHIO.—The People's Telephone

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Company has just completed traffic arrangements with the United States Telephone Company for New York and Chicago service. The United States Company is putting up a line from Akron and Cuyahoga Falls to Medina.

CARROLLTON, OHIO.—The Stark County Telephone Company has applied for a franchise for an exchange. A toll line will be built from Carrollton to Steubenville, via Harlem, New Amsterdam and Richmond.

EAST LIVERPOOL, OHIO.—The Columbiana County Telephone Company has settled the differences with striking linemen and the men have returned to work at $2.50 per day for such days only as outdoor work can be done. The company offers $55 per month for winter months.

TOLEDO, OHIO.—The long-talked-of Toledo Independent company has materialized by the organization, a few days ago, of the Toledo Telephone, Telegraph & Messenger Company, with a capital stock of $25,000. The incorporators are J. H. Bellows. L. P. Harris, C. F. Watts, H. A. Merrill and A. M. Hough. It is proposed to conduct a telephone, telegraph and messenger service in Toledo and in Lucas, Williams, Fulton, Ottawa, Erie, Ashland, Sandusky, Lorain and Cuyahoga counties. The company is backed by Toledo capital and a franchise will be applied for at once.

SWANTON, OHIO.—The Swanton (Ohio) Telephone Company has been incorporated, with a capital stock of $10,000, by P. J. Lenhart, F. A. Stuempel, F. J. Spencer, Charles F. Stolzer and Haven T. Brigham. It will operate an exchange in Swanton, with toll lines in Fulton and Lucas counties and connecting with Toledo.

ELYRIA, OHIO.—The stockholders of the Elyria Telephone Company held their annual meeting and elected W. E. Brooks, president; F. H. Sudro, vice-president. A. B. Taylor declined a reëlection as secretary and treasurer and James A. Dake was elected. The regular quarterly dividend of 1½ per cent was declared.

ZANESVILLE, OHIO.—The Zanesville Telephone & Telegraph Company and the Zanesville citizens' Telephone Company were consolidated recently, the name of the former corporation being retained. Officers were elected as follows: President, Sherman M. Granger; vice-president, W. D. Schultz; secretary and treasurer, H. A. Sharp.

ASHLEY, OHIO.— Incorporated: The Ashley Telephone Company, Ashley; capital stock, $6,000.

ADA, OHIO.— Increase of capital stock was authorized as follows: The Ada Telephone Exchange Company, from $10,000 to $30,000.

PUTNAM, OHIO.—The Putnam Telephone Company will put in an exchange at Kalida.

KENTON, OHIO.—The Kenton Telephone Company, which now has over three hundred subscribers, held its annual meeting. James L. Moore was elected president; J. B. Seymour, vice-president, and Hulan Park, secretary and treasurer. The company proposes to build a number of lines thruout the county connecting homes of the farmers.

WINONA, OHIO.—The Winona Central Telephone Company, of Winona, was incorporated at Columbus, with a capital stock of $10,000. The incorporators are Joseph E. Brantingham, Joseph Masters, Isaac Satterthwaite and M. L. Baker.

CINCINNATI, OHIO.—The county commissioners have granted a franchise to the Butler Western Telephone Company for the erection of a telephone system from the west corporation line of Hamilton, on the Millville pike, to Millville, Scipio, Reiley, Woods Station and Oxford.

CANTON, OHIO.—An ordinance was passed granting to the Stark Telephone Company the right to construct lines on the public streets of the city.

WORTHINGTON, OHIO.—The council granted the Franklin Telephone Company a franchise. An exchange will be established here and will be in operation in about a month, starting with seventy-five to one hundred subscribers, giving connections with Dublin, Powell, Flint, Goodingdale, Westeville, Columbus.

ARCANUM, OHIO.—The Arcanum council has granted a franchise to the Greenville Home Telephone Company.

PAINESVILLE, OHIO.—At the annual meeting of the stockholders of the Painesville Telephone Company, the following directors were elected: F. A. Searl, W. R. Radcliffe, E. D. Keener and E. L. House. The retiring directors were F. A. Searl, W. L. Baker, E. L. House and N. T. Breed. The reports of the officers showed the company to be in a prosperous condition and that there were 460 'phones in operation on January 1.

CHILLICOTHE, OHIO.—The Home Telephone Company, of Chillicothe, has increased its capital stock from $40,000 to $100,000.

XENIA, OHIO.—C. D. Juvenall, of Upper Sandusky; A. A. Dye, of New Philadelphia; Elias Haiman, J. M. Blatt and I. N. Dufan, of Cleveland, are organizing a local Independent company and have applied for a franchise.

XENIA, OHIO.—The Citizens' Telephone Company, of Xenia, was organized, with the following officers: President, Marcus Shoup; vice-president, John H. Platt; secretary, C. D. Juvenal; treasurer, H. H. Davenport.

SARDINIA, OHIO.— Incorporated: The People's Telephone Company, Sardinia; capital stock, $2,500.

GALLIPOLIS, OHIO.—The Gallipolis Telephone Company increased its capital stock from $30,000 to $50,000. F. M. Bow is the secretary of the company.

BATAVIA, OHIO.— Examiner Wood, who is largely interested in telephones, having established a splendid system in Batavia, Milford and Loveland, is now arranging to erect plants in Ripley and Georgetown, for which cities he has secured franchises, and will at once begin the work of building. In each of these towns he has from sixty to seventy subscribers, about forty each in Milford and Loveland.

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DAYTON, OHIO.—Incorporation authorized: Home Telephone Company, Dayton; capital stock, $100,000; by H. C. Kiefaber and others.

WARSAW, OHIO.—The Farmers' and Merchants' Telephone Company, of Warsaw, Ohio, has increased its capital stock from $5,000 to $15,000. The officers are J. P. Darling, president, and S. C. Kirsner, secretary.

RAVENNA, OHIO.—The Ravenna Home Telephone Company has elected the following directors: E. M. Waller, E. H. Taylor, W.W. Stevens, J. F. Babcock, C. F. Pitkin, H. L. Beatty. The capital stock has been increased from $10,000 to $20,000. The company will extend its lines to Sandy Lake and Windham. The company is using Eureka, Swedish-American and North instruments. Its switchboard, having an ultimate capacity of five hundred drops, is of the Eureka Company's make.

SALEM, OHIO.—The Columbiana County Telephone Company has completed traffic arrangements for interchange of service with the Phœnix Telephone Company, operating exchanges in Steubenville, New Cumberland, Mingoe, Toronto, Wellsburg and other points in that vicinity. The Phœnix Telephone Company will also have long-distance service thru the lines of the United States Telephone Company.

WARREN, OHIO.—The directors of the Warren & Niles Telephone Company have elected the following officers: Washington Hyde, president; Jules Vautrout, Jr., vice-president; J. J. McClean, secretary and treasurer; E. G. Miller, general manager. The company is putting up three thousand feet of cable in Warren and two thousand feet at Niles; eventually the entire system in both places will be cabled. A 200-drop section of switchboard is being prepared for use at Warren.

INDIANA.

BRISTOL, IND.—The Clinton Township Telephone Company has been incorporated, with a capital stock of $5,000.

LA GRANGE, IND.—The Northern Indiana & Southern Michigan Telephone Company, of La Grange, has been incorporated with a capital stock of $50,000. President, R. Ellison; secretary, Dr. Hostetler; treasurer, A. H. Johnston.

HARTFORD CITY, IND.— Cudahy Brothers, of Chicago, have sold their telephone line along their pipe line right of way from Phœnix, Wells county, to Kankakee, Illinois. The purchaser is the Union Telephone Company, of Bluffton, Indiana. The sale adds to the latter company eighty miles of line and will add extensively to the Independent system in this section of the State. The line is regarded as one of the best built among the possessions of any of the big oil concerns. It will give Independent connection with Lagro, Wabash, North Judson, Poneto and a number of other points which are now out of reach. The consideration is given at $8,000.

ELKHART, IND.—The annual meeting of the Home Telephone Company, owning the Independent plants at Elkhart and Goshen, with a number of diverging rural lines, was held. The following directors were elected: C. W. Miller, of Goshen, president; I. O. Wood, of Goshen, vice-president; H. B. Sykes, of Elkhart, treasurer; George H. Fister, of Elkhart, secretary and general manager.

MUNCIE, IND.—The United Telephone Company, which has gained a strong foothold in Jay, Randolph, Wells, Adams and Allen counties, has representatives in this section prospecting quietly with the idea of putting in Independent plants in this county.

BOURBON, IND.—A franchise for a telephone line from Bourbon, Indiana, to the Kosciusko county line and from Bourbon to Tippecanoe, Marshall county, Indiana, was granted yesterday to Jacob Martin. The line will form a part of the Commercial Telephone Company's system.

MADISON, IND.—The plants of the Bell and the New Home Telephone companies, at Madison, have been consolidated, with Capt. William Kirk holding the controlling interest.

BLOOMFIELD, IND.—The telephone company of Bloomfield. Capital stock, $15,000. Directors-incorporators, John F. Slinkard, Gilbert H. Hendron and Ziba P. East.

HUNTINGBURG, IND.—The Home Promotion Company, which recently purchased the Dubois County telephone lines, has merged into the Dubois County Telephone Company. The officers of the company are: President, Henry Landgrebe; vice-president, C. R. Ramsbrok; secretary, Hugo C. Rothert; treasurer, Philip Dilly.

PERU, IND.—Jerome B. Herff has secured a telephone franchise at this place.

KOKOMO, IND.—The Jay Brothers, of this city, have purchased an interest in the Kokomo Independent Telephone plant. When completed it will cost $50,000. Competition has stimulated the telephone business in this city. Last September, before the new company started business, only 225 telephones were in use, but after a three months' fight between the competing companies, there are 1,300 instruments in use. The war is still on, and the struggle is extending into the country and near-by villages. The Bell Company has cut the resident rate to 50 cents per month, but the new company successfully maintains its original rate of $1.25 for residents and $2 for business houses. The new system has 850 subscribers and the old one 450.

INDIANAPOLIS, IND.—The Indiana Supreme Court has decided that laying telephone wires under the sidewalk in front of a city lot is not a use of the street for which the owner of the lot is entitled to either damages or an injunction.

IOWA.

MARSHALLTOWN, IOWA.—The following are the officers of the new company: President, E. B. McCrill, of Albion; vice-president, D. M. Ferguson, of Le Grand; treasurer, H. J. Reidell, of Albion. They propose to establish an exchange in this city, by which

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connection with something over a thousand rural telephones can be had.

KEOTA, IOWA.—One hundred farmers near here have planned to build a telephone line early next spring which will not be equaled by many in the State. The line proper will be nine miles long and will connect Keota and South English, at both of which points it will join the long-distance switchboards.

CRESTON, IOWA.—William Hamilton, J. C. Sullivan and John Hackett, of Creston, own the Mutual Telephone System, of Creston. They have over three hundred 'phones in that city and now propose to branch out from there by constructing a line to Greenfield.

OWASA, IOWA.—The people of this community have been working for a telephone line between here and Eldora for some time, and Monday a meeting was held at Berlin and the following officers elected: President, Thomas Crossan, of Eldora; secretary, G. A. Lynk, of Hughes; treasurer, Charles Granzow, of Owasa. Work is to begin as early as the ground will permit.

CORYDON, IOWA.—A company has been formed to build a telephone line from Corydon to Cambria. The company is composed of sixteen members, with A. Woolis, president; Harve Gilbert, secretary; George Walker, treasurer. It will be known as the Wild Cat & Cambria Telephone Line.

OSAGE, IOWA.—New corporation: Mitchell County Telephone System, of Osage, Iowa; capital stock, $50,000; incorporators, J. W. Barrett, A. E. Roberts, G. E. Marsh, F. J. Atherton, C. R. Groves, J. W. Annis and C. F. Bennett.

CORRECTIONVILLE, IOWA.—The Correctionville council has taken the preliminary steps to grant to M. D. Harter, of Sac City, the franchise for a telephone exchange.

SPENCER, IOWA.—The Spencer Telephone Company, capitalized at $15,000, has filed articles of incorporation.

CORNING, IOWA.—The Corning Telephone Company has filed articles of incorporation with the Secretary of State. Its capital stock is $10,000. John A. Anderson, Frank L. Mercer and others are the incorporators.

OLDS, IOWA.—The Olds Telephone Company has filed articles of incorporation with the Secretary of State. Its capital stock is $1,800. H. K. Smith, president; J. W. Brown, vice-president; A. Noribom, secretary; J. E. Lindeen, treasurer, and P. J. Alvine, C. O. Nelson and J. M. Gahringer are the incorporators and directors.

DES MOINES, IOWA.—The Mutual Telephone Company has orders in for two new switchboards, one of three hundred capacity and the other of two hundred. The first is to be installed in the east-side office and is to be in readiness for use by March 1. The other board is to be placed in the main office on the west side, and thus increase the battery for West Des Moines by five hundred wires, the installation of the east-side office making the increase with the new board that much for the subscribers. From twenty-five to thirty new 'phones per month are being installed in the business and residence districts, and the company finds an increase of its capacity an absolute necessity.

MAQUOKETA, IOWA.—Articles have been filed by the Maquoketa Telephone Company; capital stock is $45,000. H. T. Brigham, C. B. Miller, F. J. Spencer and W. G. Shon are the officers. Miller is from Clinton; the others are from Wauseon, Ohio.

BRITT, IOWA.—The Western Telephone Company has purchased the entire stock of the Iowa & Nebraska Telephone Company, valued at $100,000. This includes the exchanges at Sheldon, Sibley, Estherville, Spirit Lake and Cherokee. The Western Company operates 2,700 miles of line in Iowa, Minnesota and the Dakotas.

MISSOURI.

GALLATIN, MO.—The Daviess County Telephone Company has been incorporated, with capital stock of $5,000, by C. J. Bain, J. W. P. Love, M. L. Bain and others.

RICHMOND, MO.—The Richmond Telephone Exchange is now owned by Dr. L. D. Greene, Dr. E. H. Glascock and William Rust. Frank Taggart, for many years owner of one-half the property, and its manager, retires.

RICH HILL, MO.—A franchise was granted at a special meeting of the council to S. K. Earnest, of Humboldt, Kansas, for a new telephone line in this city, to be known as the Rich Hill Telephone Company.

FREDERICKTOWN, MO.—Citizens' Telephone Company, of Fredericktown; capital stock, $5,000. Incorporated by H. M. Whitener, E. D. Anthony, E. L. Graham and others.

HANNIBAL, MO.—A telephone company has been organized at Ely with the following officers: President, I. P. Stephens; vice-president, Jesse Hymers; manager, S. R. Emery; secretary and treasurer, Thomas Boone. The company now has about nineteen miles of line, reaching from Monroe City to Palmyra. R. P. Emery, a representative of the company, was in Hannibal looking into the matter of extending the line to this city.

MONTGOMERY CITY, MO.—The People's Telephone Company of Montgomery County, Montgomery City, Missouri; capital stock, $3,100; incorporators, H. Ellis, New Florence; T. Marlow, Americus; W. Crane, Minneola; W. Crockett, Montgomery City, and F. E. Neidergerke, Big Springs.

EDINA, MO.—L. E. Primm granted permission to erect telephone line from Edina to Colony.

WEST PLAINS, MO.—F. G. Taggart has sold the Richmond Telephone Exchange to Dr. L. D. Greene and E. H. Glascock.

KANSAS.

WICHITA, KAN.—A. R. Champlin, of Newton, Kansas, has applied for a long-distance franchise.

KINGMAN, KAN.—The Kingman Telephone Company has been chartered with a capital stock of $3,000. Mort Albaugh is one of the stockholders.

HUTCHINSON, KAN.—The Hutchinson Tele-

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phone Exchange Company filed articles of incorporation. It is capitalized at $25,000 and the incorporators are M. W. Clay, W. S. Clay, W. W. Sivright, E. J. Stearns, W. E. Harrington, William Davidson and C. G. Odquist.

TOPEKA, KAN.— Charters have been issued to the Farmers' Lumber Company, of Onaga, with a capital stock of $16,000, and the Kingman Telephone Company, with a capital stock of $3,000.

CAWKER CITY, KAN.— Cawker City granted a franchise to parties who will put in a telephone exchange, work to be commenced within twenty days and completed within two months. Toll lines will connect the town with Tipton, Dispatch, Stuart and Lebanon.

MANHATTAN, KAN.—The towns of Riley and Leonardville, in this county, are each to have a local telephone exchange, with a toll-line connection. The work of construction has commenced. Each of the towns has a population of about three hundred. Telephone promoters of central Kansas are so eager to extend their operations that many of the little towns of one hundred and fifty to five hundred are given exchanges.

MINNESOTA.

WHITE BEAR, MINN.— Ordinance passed council granting franchise to John H. Spink, George H. Reif, Philip Gilbert, Ralph A. Powell and J. S. Chilsolm.

SAUK CENTER, MINN.—A. B. Kerlin, manager of the Northern Minnesota Telephone Company, who recently constructed a line from here to Akeley, Minnesota, has just sold it to the Minnesota Electric Telephone Company, and will go West in a few days to inspect another territory ripe for a telephone service. This line has twenty-one stations, and is a good paying one. It will now be extended west thru Stiles and Westport to a connection with the Minnesota Electric Company's line at Villard.

MINNEAPOLIS, MINN.— While Receiver Webster, of the Mississippi Valley Telephone Company, found no money on hand when he took charge of the affairs of the company, he has managed so well that he has been able to pay the salaries of the employes. He has faith in the idea of an Independent company, and thinks that he will be able to operate the concern and pay good dividends.

WADENA, MINN.— Northern Minnesota Telephone Company has sold its lines to the Central Minnesota Telephone Company, of Willmar, for $25,000. This sale includes all its exchanges from Sauk Center to Akeley, also its franchises in Staples, Melrose and Monticello. Exchanges will be placed in these places at once.

WILLMAR, MINN.— D. N. Tallman, acting for the Minnesota Electric Telephone Company, recently incorporated, has purchased the lines and business of the Northern Minnesota Telephone Company. The purchase price was in the near neighborhood of $25,000. D. N. Tallman, of this city, is at present at the head of five telephone companies, and the capital stock which they represent is $315,000.

SPRING VALLEY, MINN.—The Pierce County Telephone Company has made arrangements to put in a local exchange, connecting with St. Paul and the whole Northwest.

ALBERT LEA, MINN.—The local telephone exchange was sold, the price being an even $10,000. The buyer was S. H. Cady.

ALBERT LEA, MINN.—The Albert Lea Telephone Company will take over the local telephone system and replace all of the old instruments with new ones, put in a new switchboard and add several new wrinkles. The first board of directors of the company will be as follows: Simon Strauss, George W. Johnson, Clint L. Luce, Henry A. Morgan, Charles Arthur Ransom, Charles F. Towne, William W. Parker. The capital stock is $15,000.

PARK RAPIDS, MINN.—The Northern Minnesota Telephone Company, with headquarters at this place, has sold its lines to D. N. Tallman, of North Dakota. The consideration was about $25,000. The company was organized here in 1898, with A. B. Kerlin, president; Cyrus Hollinger, vice-president, and C. F. Moody, secretary and treasurer. The line then extended from Park Rapids to Hubbard and Manahga. Since then it has been extended to Akeley on the north and Sauk Center on the south, and besides being connected with all stations between those towns, has exchanges at Long Prairie and Wadena. Mr. Tallman already controls about four hundred miles of telephone lines in the western part of the State and will, it is understood, connect the two lines by putting in a short line between Sauk Center and Villard.

HUTCHINSON, MINN.— The Hutchinson Telephone Exchange Company, St. Paul, Minnesota; capital stock, $25,000; incorporators, M. W. Clay, W. S. Clay, W. W. Sivright, E. J. Stearns, W. E. Harrington, William Davidson and C. G. Odquist.

DULUTH, MINN.—The comptroller was directed to examine the books of the Zenith City Telephone Company in order to ascertain what the company's gross earnings were for the year. By the terms of the company's franchise, one-half of one per cent of its gross earnings are paid to the city. According to the report submitted by the company, the city's share of last year's earnings is about $120.

DAKOTAS.

ALEXANDRIA, S. D.— Charles E. Wisard, who put in a telephone line in this city, will do a like job for Woonsocket.

WEBSTER, S. D.—Alexander Ross is making arrangements for the establishment of a local telephone exchange.

PIERRE, S. D.—Articles of incorporation have been filed for the Dakota Telephone and Electric Company, at Geddes, with a capital stock of $150,000; incorporators, George E. Wickes, Edward C. Ward and Frank Exline.

WOONSOCKET, S. D.—The Woonsocket Telephone Company, Woonsocket, S. D.; capital stock, $2,500; incorporators, E. M.

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Smith, S. A. Ramsey, J. C. Whiting and C. V. Templeton.

TEXAS.

AUSTIN, TEX.—The Austin Telephone Company has been incorporated, with a capital stock of $1,000,000. The incorporators are J. E. Boynton, J. B. Earle, of Waco; C. H. Rose, of Columbus, Ohio; J. S. Bailey, of Wauseon, Ohio, and G. H. Baker, of Defiance, Ohio.

AUSTIN, TEX.—Austin City Telephone Company, of Austin; capital stock, $100,000; incorporators, J. S. Brailey, H. G. Baker, Z. B. Campbell, J. B. Earle and J. E. Boynton.

TEMPLE, TEX.—J. B. Earle and J. E. Boynton have obtained franchise for constructing and operating telephone exchange.

HEMPSTEAD, TEX.—The commissioners' court granted the Independent Telephone Company permission to use streets, alleys, etc., in Hempstead to erect poles and string wires, to establish a local telephone exchange. The same privilege was granted the Southwestern Telegraph & Telephone Company.

LA GRANGE, TEX.—The Fayette County Telephone Company has been incorporated, with capital stock of $5,000, to construct and operate a telephone system, by John Schumacher, Leo Frede and Charles A. Perlitz.

WICHITA FALLS, TEX.— The Wichita & Charlin Telephone Company has been incorporated, with capital stock of $1,500, by W. D. Bently, D. E. Bently, H. T. Dunn and others.

MARYLAND.

RIDGLEY, MD.—The Eastern Shore Telegraph & Telephone Company, of Caroline county, held its annual meeting at Ridgley and elected the following officers for the ensuing year: Harry A. Richardson, president; Thomas L. Day, vice-president; Fred R. Owens, secretary, and Dupont Walker, treasurer. The president's report shows that there are now eighty towns connected on the peninsula and nearly a thousand telephones. The company is now constructing lines in Kent county and will continue them thru Queen Anne county and connect with the system between Denton and Easton.

BALTIMORE, MD.— It is reported that the three telephone companies of Accomac and Northampton counties will unite under one management. They are the Atlantic Telephone Company, with seventy-five 'phones, operating from Pocomoke City to Accomac Courthouse, the Onancock Telephone Company, with sixty-five 'phones, operating from Accomac Courthouse to Keller, and the Peninsula Telephone Company, operating from Keller to Cape Charles, with one hundred 'phones. Thomas B. Quimby has just bought the controlling interest in the Peninsula Company for $6,000. All three companies are in good financial condition, paying fifteen per cent in dividends apiece annually.

ELLICOTT CITY, MD.—The Howard Telephone & Electric Lighting Company was incorporated. Its capital stock is placed at $25,000, divided into five hundred shares. The petition for right of way sets forth the intention to establish telephone connection with Dayton, Clarksville, Elkridge, Annapolis Junction, Guilford, Lisbon, Alberton and Woodstock, with Ellicott City as the center. Under a specification in the grant of right of way they must begin work within six months. The Howard Company has already commenced operations and will push the work to completion. The incorporators organized by electing the following officers: R. Abbey Martin, president; Edmund Walton, vice-president and general manager; William W. Burton, secretary; Robert J. King, treasurer; William E. Riley, general superintendent.

CHESTERTOWN, MD.—The work of putting in long-distance telephones commenced in Chestertown by the Diamond State Telephone Company. The line is in operation as far as Kennedyville, seven miles north of Chestertown. The Diamond State has purchased, in addition to the more elaborate system of the Kent County Telephone Company, the Tolchester line and the private line connecting Betterton and Still Pond with Lambson's Station, on the Baltimore and Delaware Bay Railroad. This places the entire telephone system of the county in their hands.

GEORGIA.

WINDER, GA.—Judge Russell, Messrs. M. D. Irwin and T. C. Dunn have formed a $6,000 stock company to establish a telephone exchange for the city of Winder, and will begin work at once. They will run a line from here to Athens and Atlanta in connection with their exchange.

MACON, GA.—The St. Petersburg Telephone Company has been incorporated by T. C. Parker, John W. Markham, Charles L. Goodrum and William B. Birch, for construction of telephone systems, etc.; capital stock is $10,000.

CARROLLTON, GA.—The Gainesboro Telephone Company, which completed long-distance connections here last fall, and which has extended its service to Bremen and later to Bowden, has just finished connections to Victory and Tyus, two important country points, and has begun to extend from Bremen to Waco and possibly will immediately continue to Tallapoosa. They have arranged to start a line to Buchanon, the county seat of Haralson, twenty miles north of here.

TEMPLE, GA.—J. B. Earle and J. E. Boynton have obtained a telephone franchise here.

KENTUCKY.

NICHOLASVILLE, KY.—The company reported to be organized by B. W. Arnett and others for construction of telephone system has been incorporated as the Nicholasville Home Telephone Company. At a meeting of the city council the company was sold a franchise for $25, the company's rates not to exceed $2 a month in business houses and $1 in residences within the city limits. Work on the new plant will begin immediately.

LEXINGTON, KY.— On Monday, March 14, 1901, at 12 o'clock noon, I will offer at public

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auction, in the council chamber, a franchise or privilege to construct, establish, maintain and operate a telephone system in the city of Lexington, Kentucky. Said sale is made under the provision of Ordinance No. 1241. The franchise will be awarded to the highest and best bidder, subject to the approval and satisfaction of the general council, and reserving the right to reject any and all bids.

H. T. DUNCAN, Mayor.

ASHLAND, KY.—The Hanover & Henrico Telephone & Telegraph Company has been chartered, with capital stock of $5,000, by W. C. Saunders, E. S. Campbell, M. D. Hart, E. L. C. Scott and John G. Pollard, to conduct general telephone and telegraph business.

LEXINGTON, KY.— Incorporated: The Fayette Home Telegraph Company; capital stock, $25,000; by J. R. Allen, T. W. Bullock, J. H. Shouse, Charles Kerr and L. G. Coe.

ELIZABETHTOWN, KY.—The Hardin County Telephone Company has been incorporated, with capital stock of $2,000, for construction of telephone system.

TENNESSEE.

MEMPHIS, TENN.—The charter of the Memphis Telephone Company has been filed. The capital stock of the company is fixed at $200,000 and the incorporators are as follows: William P. Curtis, S. P. Walmsley, William P. Richardson, C. B. Galloway, Jeptha M. Fowlkes, Bolton Smith, Thomas R. Reddick, Leon Hunt, James S. Warren and William A. Percy. The charter was first offered for registration August 7, 1899, but the matter was not carried forward.

HARRIMAN, TENN.—The Harriman Independent Telephone Exchange has been purchased by Leland Hume, of Nashville. The property is the personal property of Mr. Hume, and not of the Cumberland Telephone Company, as has been reported elsewhere.

KNOXVILLE, TENN.—The Southern Telephone Company will apply for charter, with capital stock of $25,000, to furnish supplies and construct exchanges for Independent telephone companies. W. O. Rhode is president, Walter S. Roberts vice-president, and Charles L. Myers general manager. Address Deaderick building.

VIRGINIAS.

HUNTINGTON, W. VA.—The Wyandotte Valley Telephone Company reported recently as incorporated, will construct telephone system. Address for full particulars, T. S. Scanlon.

HAGERSTOWN, W. VA.— Steps have been taken by the C. V. Telephone Company toward receiving Independent telephone concerns in Pennsylvania to compete with the Bell system long-distance business. Wires are now being strung between Chambersburg and Hagerstown and on to Martinsburg, and from that place to Winchester, Va. It is also proposed to have long-distance service between Chambersburg and Baltimore by way of Gettysburg. The C. V. directors had a meeting and increased the capital stock from $75,000 to $100,000.

WELLSBURG, W. VA.—The stockholders of the Wellsburg Telephone Company, at their meeting, found the company on a good paying basis, and the following officers were chosen: J. M. Walker, president; W. T. Nicholls, vice-president; George W. Russell, secretary; W. K. Cummings, manager; O. Morseman, assistant manager, and H. W. Paull, treasurer.

CHARLESTON, W. VA.—Charter issued to Wyandotte Valley Telephone Company, for the purpose of constructing and maintaining lines of magnetic telephones, and carrying on the business properly pertaining thereto. Principal office, Huntington, West Virginia; capital stock, $500; paid in $50, with privilege to raise to $25,000; incorporators, T. S. Scanlan, R. L. Archer. J. W. Hambrick, C. B. Campbell and George I. Neal, of Huntington.

ASHLAND, VA.—A charter was granted the Hanover & Henrico Telephone & Telegraph Company lately by the General Assembly. The directors of the company are W. C. Saunders, E. S. Campbell, M. A. Hart, E. L. C. Scott and John G. Pollard. The maximum capital stock is placed at $5,000, and the minimum at $1,000. The company is authorized to do a general telephone and telegraph business and to acquire old lines or to build new ones. The home office will be at Ashland.

CAROLINAS.

MONTMORENCI, S. C.—J. T. Shuler will construct system between Montmorenci and Aiken.

BARNWELL, S. C.— S. H. Brown, president and general manager of the South Carolina Telephone & Telegraph Company, has sold the exchanges and toll lines of the Southern Telephone & Telegraph Company to the South Carolina Long-distance Telephone Company. Mr. Brown has been operating this telephone system successfully for the past five years.

GAFFNEY, S. C.—The Gaffney Telephone Company has been incorporated, with capital stock of $10,000, by F. G. Stacy, president and treasurer, and W. B. Du Pre, secretary-manager.

PITTSBORO, N. C.— H. A. London and others have incorporated the Pittsboro Telephone & Telegraph Company.

TARBORO, N. C.— Mr. George A. Holderness, of Tarboro, general manager of the Carolina Telephone & Telegraph Company, arrived last week from Red Springs and Maxton, where he has just purchased the exchanges there. By this deal Fayetteville is put in telephonic communication with Red Springs, Maxton, Laurinburg, Hamlet, Rockingham, Bennettsville and other towns.

CLINTON, N. C.—Arrangements have been completed for the erection of a telephone line from Clinton to Dunn. A company, to be known as the Clinton-Dunn Telephone Company, has been organized, the necessary funds

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raised, and the work of putting up the line will begin at once.

PENNSYLVANIA.

JOHNSTOWN, PA.— Incorporated: Standard Telephone & Telegraph Company, Philadelphia, to operate in Bucks, Philadelphia, Lehigh and Northampton counties, and to make connections with other lines; capital stock, $10,000.

PITTSBURG, PA.—The Central District & Printing Telegraph Company, of Pittsburg, has purchased the Pennsylvania & West Virginia Telephone Company, formerly known as the Waynesburg, Graysville & Jacksonville Company. The purchase included 167 miles of lines, reaching from Waynesburg, Pennsylvania, to Cameron, West Virginia, and from Waynesburg to Burton, West Virginia, and other points, the owners being J. B. Fordyce, James Burns, Wyatt Sprowls, J. S. Carpenter, James Durbin and J. P. Hagan.

LANGHORNE, PA.—The Standard Telephone & Telegraph Company has been granted franchises in Langhorne, and work is to be started immediately toward installing a complete system. This company will also extend its line to Quakertown, Sellersville, Hatboro, Ivyland, Forest Grove and Bristol, thus making the Independent service very complete in the county.

READING, PA.— Incorporated: The Schuylkill Valley Telegraph & Telephone Company, Reading; capital stock, $1,000.

SELLERSVILLE, PA.— Sellersville borough council passed an ordinance granting to the Standard Telegraph & Telephone Company the right to build and operate in that borough a telephone line.

HARRISBURG, PA.—The ordinance giving permission to the Dauphin County Telephone Company to construct telephone lines in the city of Harrisburg was passed by the council.

PITTSBURG, PA.— Right of way has been obtained by the Maryland, Pennsylvania & West Virginia Telephone Company into Pittsburg. This company has lines reaching from New York to this town, and as far as Scottdale. The lines will be pushed into Pittsburg at once. It was announced here by local officials that $4,500 would be spent in Connellsville, $3,500 in Uniontown, and similar amounts in near-by towns. The improvement will be popular in this section, as the Bell Telephone Company this month raised its rates.

LEHIGHTON, PA.— Incorporated: The Overland Telephone Company, Lehighton, Pennsylvania, to erect telephones; capital stock, $15,000.

NEW YORK.

NEW BERLIN, N. Y.— New Berlin Telephone Company, of New Berlin; capital stock, $3,000; directors, I. L. Richer, E. G. White and A. H. Phelps, New Berlin.

ALBANY, N. Y.—The Subscribers' Telegraph & Telephone Company, incorporated, has a capital stock of $15,000, and will operate telephone lines between Watervliet, Troy, Albany, Rensselaer, Colonie, Green Island and Schenectady. The directors and the amount of stock each subscribes for are as follows: David S. Johnston, 50 shares, and John E. MacLean, 10, of Cohoes; William R. Condon, Charles F. Rodgers and Clarence Stowell, 10, of Albany; Thomas J. Cavanaugh, 10, of Watervliet, and Edgar T. Chapman, 50, of Colonie.

BATH, N. Y.— Bath & Cameron Telephone Company, of Bath; capital, $400; directors, Albert Crandall, A. J. Annabel and A. C. Annabel, North Cameron.

WASHINGTON MILLS, N. Y.—The Washington Mills & Norwich Corners Telephone Company has elected the following officers: D. D. Prescott, president; J. D. Richards, vice-president; C. H. Dodge, secretary and treasurer.

ROCHESTER, N. Y.— Incorporated: Genesee Valley Telephone Company, of Rochester; capital stock, $100,000; directors, J. Foster Warner, G. R. Fuller and E. M. Higgins, of Rochester.

ALBANY, N. Y.—Articles of incorporation of the Cuba Telephone Company were filed with the secretary of state. The company will carry on a telephone business in the towns of Cuba, New Hudson and Clarksville, in Alleghany county, and in the town of Lyndon, in Cattaraugus county. Its capital stock is $12,000. Its directors are Charles and Clarence Richter, George H. Swift, Henry C. Morgan, Fred C. Saunders and Charles A. Ackley, all of Cuba.

ALBANY, N. Y.—The Atlantic Telephone Company was incorporated, with a capital stock of $5,000,000. The company proposes to maintain a telephone system connecting New York city, Albany, Syracuse, Rochester, Buffalo and all the cities and villages along the route, which cities are also to be connected with other municipalities in the United States and Canada. The capital stock is divided into fifty thousand shares of the value of $100 each. The directors are William H. Slayton, of Yonkers; John A. J. Campbell, Charles B. Reid, Arthur B. LaFor and James G. Shaw, of New York city; George H. Mann, of Brooklyn, and Warren L. Sawyer, of Nyack.

CATTARAUGUS, N. Y.— Incorporated: The Cattaraugus Telephone Company, Cattaraugus, New York; capital stock, $1,000; directors, S. F. Burger, Frank Crawford and H. B. Easton, all of Cattaraugus.

BROCKPORT, N. Y.—The Rochester Telephone Company has opened an exchange at Brockport, New York, with 210 local subscribers and toll connections with Rochester. The rate for five-minute conversations has been placed at 20 cents. The company is also giving long-distance service to other places in this vicinity.

OTHER STATES.

OGDEN, UTAH.—The Home Telephone Company has asked for a franchise to establish a system in Ogden. The petition is signed by Jones & Collins, of Salt Lake,

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agents for Edward W. Hammer. Richards & Allison are the attorneys for the petitioners.

BUFFALO, WYO.—The Buffalo Telephone Company held a meeting at which a twenty-two per cent dividend was declared on all stock.

SALT LAKE CITY, UTAH.—Edward B. Hammer and others, incorporated under the name of the Utah Home Telephone Company, ask for telephone franchise. Rentals not to exceed $48 and $30 per year.

NEW LOUISVILLE, ARK.—New Louisville, Arkansas, has granted a franchise to a telephone company, permitting it to charge $2 per month for the use of all telephones, or $2.50 for business telephones and $1.50 for private residences.

GUTHRIE, OKLA.—The Osage Telephone Company was granted a charter January 12. Its capital stock is $10,000. The incorporators are Elijah N. Yates, W. Brideville and Elliott B. Graves.

GREENVILLE, ME.— Incorporated: The Moosehead Telephone Company, Greenville, Maine, to maintain telephone lines around Moosehead Lake; capital stock, $10,000. Officers: President, Charles D. Snow, of Greenville; treasurer, Charles A. Judkins, of Kineo.

WASHINGTON, D. C.— Charter granted at Dover for the Telephone Company of America, of Washington, D. C., to manufacture telephones and telephone supplies and to operate machine shops and foundries; capital, $5,000,000.

ST. PETERSBURG, FLA.—Articles of incorporation have been filed for the Florida Subpeninsula Transportation Company, capital stock $1,000,000, to construct electric railways and lighting plants, telephone systems, etc. John P. Martin, of Xenia, Ohio, president; Charles Orr, Cleveland, Ohio, vice-president, and John P. Martin, Jr., Petersburg, secretary.

TARPON SPRINGS, FLA.—A coöperative telephone company has been formed here.

ST. PETERSBURG, FLA.—The St. Petersburg Telephone Company is making arrangements to build a line to Tampa.

HARTSELLE, ALA.— Mr. J. C. Rogers has sold his local telephone interests to S. L. Sherrill and L. O. Waldsmith.

ANOTHER BELL DEFEAT.

Several months ago the Bell Company, or the Missouri & Kansas Telephone Company, applied to the city council of Carthage, Missouri, for a franchise, at the council meeting held January 28, 1901. The Carthage, Missouri, council voted unanimously, refusing to grant the Missouri & Kansas a franchise. The Carthage Electric Telephone Company has just ordered its sixth hundred American express board. The company has close to five hundred 'phones in operation, an increase of 275 'phones within a year and a half. It also has about twenty-five subscribers on its books for whom the telephones have not yet been put in.

VERDICT FOR INDEPENDENT COMPANY.

The fight in the United States Court at Toledo, Ohio, between the Bell Company (Central Union) and the Independent Company at Bryan, Ohio, came to a sudden termination the other day, when, at the close of the presentation of its case by plaintiff, Judge Wanty instructed the jury to bring in a verdict for the defendant.

The battle was hard fought on both sides. The plaintiffs claimed that the Bryan Telephone Company had used unfair means to get business and asked damages in the amount of $10,000.

It was the opinion of the court that the plaintiff had not substantiated its claim of damages due and he therefore decided not to hear the other side of the case.

Most of the throng of witnesses who had been brought down from the Williams county capital were not even called to the stand.

MOVES TO MILWAUKEE.

The Badger State Long-Distance Telephone Company, at its annual meeting, decided to move to Milwaukee, and elected the following officers: President, Edwin Reynolds; vice-president, W. D. Gray; vice-president, A. S. Baker; secretary, C. F. P. Pullen; treasurer, George L. Pullen.

The company operates in Dane, Rock, Green, Lafayette, Jefferson, Walworth and parts of other counties, taking in forty cities and villages and eighteen exchanges, has 300 miles of good poles and 400 miles of wire, and is still extending its scope of operations.

At present the company is charging $2 per month for business and $1.25 for residence telephones. The company will carry out its present contracts, but it is stated no new contracts will be made at the present rate, which will be raised.

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TRADE NOTES.

THE Electric Appliance Company, Chicago, is out with a new hotel telephone which it claims has many points of advantage over other makes on the market. It is sending descriptions of this instrument to dealers and contractors thruout the country.

THE Garton Daniels Company, of Keokuk, Iowa, offering the new G. D. extension circuit devices, has already received a warm welcome. It is receiving many orders and inquiries for these devices and also states that it is making a special sample offer, which will be noted in our advertising columns.

WE are in receipt of the catalog for 1901, containing a full line of McRoy goods. The catalog is a good bit like the McRoy conduits, that is, excellent. The company will be pleased to send you one upon receipt of your inquiry. The catalog shows some very interesting views in the laying of ducts.

THE Western Telephone Construction Company, Chicago, Illinois, while it does business on the basis of the golden rule, is sending out to those who ask for it a 12-inch brass-bound rule. The company would be pleased to receive your request for its rule, together with some of its excellent printed matter.

WE are in receipt of a booklet which is a copy of the list of products of the American Steel & Wire Company. This book should be in the hands of every telephone man, as it contains some very interesting information. The company will be pleased to send it to any address upon receipt of inquiry. The American Steel & Wire Company. Rookery building, Chicago, Illinois.

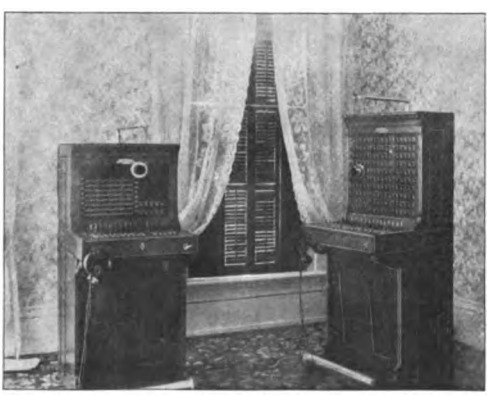

EXHIBIT OF THE KELLOGG SWITCHBOARD AND SUPPLY COMPANY AT THE WISCONSIN CONVENTION.

THE Independent Telephone Supply Company, of No. 19 South Canal street, Chicago, Illinois, has on hand ready for prompt delivery seventy telephones, bridging, desk and series, the make of some of the leading manufacturers. Some of these goods have hardly been in use twelve months and are all in first-class condition. Any one interested in secondhand telephones would do well to write for prices on these.

WE are in receipt of a catalog from Smith & Hemenway, 296 Broadway, New York, which they call their "Green Book" of hardware specialties. There are a number of articles in hardware specialties that are in use by telephone men and any one interested in the telephone business would do well to write the Smith & Hemenway Company for a copy of its "Green Book," which it would be pleased to send, together with its special discount sheet. This company also represents the Utica Drop Forge Tool Company, which makes a specialty line of linemen's tools that can not be excelled. Its pliers are the equal of any of the imported tools. The "Green Book" also contains a full description of these tools.

THE North Electric Company has opened a branch office in Chicago, this office to be in charge of Mr. George W. Conover. Mr. Conover will also continue as a purchasing and forwarding agent, as he has in the past. We wish Mr. Conover and the North Electric Company success in their new undertaking, and we know full well that with a line of goods that the North people manufacture and a man like Mr. Conover, these two things combined are bound to bring success. Mr. Conover has been in the telephone business a number of years with the Bell Company, and we are glad to see him over at the Independent camp. The office will be located at 1511 Monadnock building, Chicago, Illinois, U. S. A.

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SUCCESSFUL INDEPENDENT EXCHANGE.

One by one the strongholds of the Bell Telephone Company in Ohio are slipping from its grasp, and indications seem to bear out the prophecy that within a very few years the old Bell Telephone Company will be a very unimportant factor in Ohio telephonedom. Akron is a bustling, hustling manufacturing business town, and is one of the brightest ornaments in Ohio's municipal crown. Here the Bell Telephone Company held undisturbed sway for many years until, grown autocratic, its service diminished in quality and increased in price to customers. The result was that citizens' indignation meetings were held, resulting in the appointment of a citizens' committee, instructed to secure better terms from the old Bell Company. They got no satisfaction from the old company, and at this juncture Will Christy, J. R. Nutt, and other prominent Akron business men went to the committee and offered to establish an Independent telephone plant if they were promised the coöperation of the committee. The assurance was given, and both parties acting in good faith their efforts resulted in the formation of the Akron People's Telephone Company, which was organized May, 1899, with a capital stock of $50,000. This in a year was increased to $200,000, and last year to $500,000, only $250,000, however, of it being issued. Nothing but success has attended the efforts of this company, and now it has 1,900 subscribers, which is more than the Bell Company ever had, and the demand for the company's service has made it necessary to order an additional switchboard with a capacity of 600 subscribers. A better idea of the condition of this company can be obtained from the statement recently prepared for the use of the officers, which statement shows that there is now due from rental contracts for the first quarter of 1901, $9,281.41; from toll lines, $445; total receipts, $9,726.41. The expenses for the quarter will be $6,282, leaving a surplus for stock for the quarter, $3,444.41. Contracts already signed, but on which telephones have not yet been furnished, guarantee the addition for the next quarter of $503. This will give the company practically $16,000 net, after paying interest on bonds and expenses. The company has more than one hundred stockholders, the majority of whom live in Akron. The Federal Telephone Company owns 33⅓ per cent of the stock of the Akron Telephone Company.

WHAT FARMERS CAN DO.

B. O. Clonser, of Darlington, Indiana, writes: "I notice in a recent issue of your paper an article on public telephones. All people differ somewhat on public questions as a general rule, and we have a telephone system here, the history of which will no doubt interest some of your readers. We organized January 30, 1900, with thirteen subscribers. Each subscriber was to build his line, or portion of line (that is, if more than one went on one line) to the central office, and pay his quota of expense in the purchase of switchboard and fixtures, which amounted to about $3.50 each by the time we were ready for the board, as quite a number subscribed before we made the purchase. That only gave us one town, so we organized similar companies in the adjoining towns, each company coöperating with the other. We are still organizing and building lines. We now have about thirteen hundred 'phones, and access to portions of four counties, with a bright outlook for the future. Our company is out of debt, and each man owns his own 'phone, and it really is his own. We get and give the best of service, tho a banker here said farmers are too ignorant to run a telephone system. The farmer can do it and at actual cost, which we have found to be only $2.40 per year per 'phone as company's expense, and 13 cents individual expense, making a total of $2.53 a year per 'phone. Get your company or system started. Let your neighbors talk a few times and learn what a 'phone is good for, and you can not keep from getting one. I sit in my house and talk to my neighbors, hire men to work on the farm, and when election comes, or something important is going on, I hear the news."

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IMPORTANT SUIT WON.

The Citizens' Telephone Company, of Lansing, Michigan, has been declared the winner in an important suit brought against it in the United States district court at Grand Rapids by the Western Electric Company, which involved the use of devices in connection with its switchboard and ring-off drop. The Western Electric Company is the manufacturer for the Bell Telephone Company and the failure of the suit is a severe blow to the Bell Company, in its efforts to restrict the Citizens' Company from the use of indispensable devices on which it holds the United States patent. Judge Severens ruled that the Citizens' Company was justified in using the devices, altho the foreign telephone system which is used by the Citizens' Company was different from that on which the Electric Company holds a patent, only in a few minor details. He therefore ruled that the complainant's case must fail and that the bill should be dismissed. This is the last and most important of five suits brought against the Citizens' Company by the Electric Company.

The decision of Judge Severens will probably put an end to all litigation that can be brought against the Independent companies by the Bell people on the switchboard devices.

Had the Western Electric Company won the case the Citizens' Company would have had to have weakened its system materially or been forced to the expenditure of a large sum of money.

ON A BLACKLIST.

George Wetzel, a lineman at Buffalo, New York, sued the Bell Company for $25,000. He alleges that the company has blacklisted him and kept him out of employment since he went out on strike with other linemen. The motion was argued in special term before Justice Hooker. Justice Hooker reserved his decision.

Attorney Porter Norton, representing the company, said the company knows nothing about any blacklist and wants further information from the plaintiff. "The company has never prevented or tried to prevent Wetzel from getting work," he said.

Attorney George N. Frazine, who appeared for the plaintiff, scoffed at that statement and said that the blacklist had been shown to his client; that its possessors told him they dare not employ him in view of his name being on that list.

RURAL LINES IN IOWA.

The growth of strictly rural telephone lines in Iowa has been more phenomenal, if possible, than the growth of telephone exchanges in the smaller towns and the long-distance connecting lines. All northern Iowa is covered with Independent long-distance lines and in central Iowa there has been the greatest development of the telephone lines for the exclusive use of farmers and those living in small towns. A meeting was held at Marshalltown of the rural lines in central Iowa to take united action looking to closer connection with the cities. The lines represented at the meeting were the line from Eldora to Whitten; from Liscomb to Conrad, thru Grundy county; from Bangor to Liscomb, and in surrounding country; the Bethel line, running thru the Arney settlement west of Albion; the line from Arney to Marshalltown; the Stanford line from Liscomb to Union; the Rock Valley line, southeast of Marshalltown, and the line from New Providence to Eldora. Work has been completed on a new line from Liscomb to North Star, four miles east, that will be patronized by thirteen farmers. A company has been formed to run a line from Hubbard to Zearing. It will operate twenty 'phones. In that immediate vicinity there are now in operation about one thousand rural telephones. It is proposed that they be connected with the larger cities and towns and that they operate together all thru central Iowa for exchange of business among the farmers.

"I CONSIDER your paper the most practical and comprehensive periodical that is being published in the interest of telephony." L. H. LANCASTER.

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A called meeting of the Independent Telephone Association of Illinois was held at Champaign, February 6. The meeting was presided over by W. B. Burke, secretary of the association, owing to the absence of the president, Dr. Lumkins. There were discussions over farmers' lines in regard to the method of dealing with them. The bill which Mr. Stubblefield had introduced into the Illinois House was discussed, and after a vote upon the same it was decided that it was not a good bill for the Independent movement. There was a paper read by Mr. Doolittle, of La Fayette, Indiana, on protection against lightning and sneak currents. Mr. A. J. Kusel read a paper on farmers' lines and how to prepare for them. The members of the association were invited to visit the University upon the following day and the matter of taking up and furnishing toll-line connections thruout the State was discussed, and it is hoped at the next meeting this matter will be taken up and gone thoroly into. There were a number of exhibits, and they were presided over as follows: Alden Electric Company, Carl J. Schlesinger; Stromberg-Carlson, Paul D. Myers; Sterling Electric Company, W. E. Doolittle; Eureka Electric Company, H. J. Kusel; American Electric Telephone Company, W. A. Barnes; McQuat Electric Company, R. L. McQuat and A. O. Einstein; Stoddard Telephone Company, E. L. Stoddard; National Automatic Telephone Company, Mr. Baldwin and Mr. Dawson. The members in attendance were as follows: E. S. Sterrett, Henry; P. D. Myers, Chicago; M. E. Grant, Wenona; C. O. White, Princeton; John W. Gay, Mattoon; G. F. Haworth, Danville; E. H. Alexander, Champaign; Perry W. Warner, Rossville; B. F. Wasson, Farmer City; A. O. Harrison, Sullivan; George B. Spiller, Mount Zion; O. B. Chamberlain, Hoopeston; D. F. Holliday, Indianapolis; Oscar Bonnett, Le Roy; John Woodin, St. Joseph; A. B. Glascock, St. Joseph; D. C. Morrissey, Champaign; J. H. Davis, Danville; C. C. McElwee, Sidney; E. Van Sickle, Dana, Indiana; George W. Fair, Chrisman; O. K. Benton, Isabel; George W. Hughes, Hume; J. A. Seybold, Sidell; W. S. Thompson, Fithian; W. H. Ramsey, Auburn; C. W. Shimel, Casey; The press, A. J. Kusel, TELEPHONE MAGAZINE.

The annual meeting of the Wisconsin Telephone Association was held at Madison, February 13 and 14. The officers elected were as follows: President, A. L. Hutchison, Weyauwega; vice-president, C. H. Schwitzer, La Crosse; secretary and treasurer, H. C. Winters, Madison. An executive committee was chosen, consisting of the following members: R. Valentine, Janesville; F. H. Sweet, Fond du Lac; W. J. Bell, Barbaboo; J. Gaynor, Grand Rapids, and W. F. Gumaer, Appleton. An adjourned meeting of the association will be held in La Crosse next June, and the regular annual meeting in Milwaukee next January. The program of the first day was a paper by Mr. Abbott, of the Roebling Company, on the manufacture of wires, and a paper on Farmers' Mutual telephone lines by Mr. W. J. Bell, of Baraboo. There were a number of discussions on farmers' lines and toll tariffs. During the afternoon Mr. J. Nate, of the Standard Telephone and Electric Company, invited the members of the association and visitors to a sleigh-ride across Lake Menona, and a supper at Oak Park. There were a number of speeches made at the table, some too lengthy to repeat, and some too short to write about. The meeting on the following day was called to order at 10:30. There were papers read by W. W. Dean, A. J. Kusel and W. H. Doolittle. In the afternoon a visit was made to Science Hall, Wisconsin University, where Professor Trowbridge lectured on wireless telegraphy, and gave demonstrations, together with a lecture, on Professor Pupin's discovery.

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There was another session in the evening, at which a resolution was adopted and a committee appointed to urge the Legislature not to pass Mr. Rossman's bill fixing a schedule of telephone charges, and compelling interconnection of all telephone lines in the State. Twelve new companies joined the association.

Exhibits were made by all the leading manufacturers and were in charge of the following gentlemen: Madison Company, Mr. Jim Nate; The Holtzer-Cabot Company, Mr. Harding; Eureka Electric Company, Mr. I. J. Kusel; Sterling Electric Company, Mr. W. H. Doolittle: Kellogg Switchboard & Supply Company, Mr. Paul Bossert, Mr. W. W. Dean and Mr. Manson; Electric Appliance Company, Mr. Sam Densmore; American Electric Telephone Company, Mr. W. A. Barnes; The J. A. Roebling Company, Mr. Abbott and Mr. Slingoff. The press, A. J. Kusel, TELEPHONE MAGAZINE.

The third annual meeting of the Independent Telephone Association of Michigan was held at Lansing, Michigan, February 6. The meeting was presided over by the president, Mr. J. B. Ware, of Grand Rapids. Mr. Ware delivered the opening address, in which he said, "Not one Independent company has failed in the past four and one-half years, and most of them are paying quarterly or semi-annual dividends." The officers were elected for the ensuing year as follows: President, James B. Ware, Grand Rapids; vice-president, Orin Morrow, Benton Harbor; secretary, C. F. Brown, Alma; Prof. J. H. Filde, St. Johns. Executive Committee—the above officers and J. R. Hyde, Hart, Michigan; W. O. Hunt, Adrian; C. W. Gales, Owasso; R. F. Johnson, Saginaw. Papers were read and the leading questions were up for discussion. The meeting was in session two days; there were a number of exhibits by leading telephone manufacturers and supply men.

DEAR SIR, — The fifth annual meeting of the Iowa Telephone Association will convene in the clubrooms of the Savery Hotel at Des Moines, Iowa, on Tuesday, March 12, 1901, at two o'clock P.M, for a two days' session.

It is urgently requested that every member be present. Under separate cover we send a synopsis of the minutes of the last annual meeting. The program for this year's meeting is being prepared by the committee, who will be pleased to receive any suggestions from members who desire special subjects discussed. Address all communications on this subject to the secretary.

Your attention is called to the map of the Independent telephone lines of the State, prepared under the auspices of this association, and now being distributed by O. H. Carpenter, of Iowa City. It is extremely important that this map should be made and kept accurate. You are therefore requested to notify Mr. Carpenter of all extensions made by your company during the past year, in order that they may be properly mapped.

We desire to make this the largest and best meeting ever held by the association, and we need the coöperation of every member to accomplish this.

One of the most important questions to be discussed at this meeting is the matter of checking reports and making settlements between companies for inter-line toll business. Your attention is called to this in order that we may have a full discussion of the subject. Another very important subject which will be discussed at this meeting is "Farmer's Lines," their construction, equipment and the rates to be charged them, etc.

The annual dues of the association are $5. Members will please remit.

Come out to the meeting and bring others with you.

Yours truly,

CHAS. C. DEERING,
Secretary.

J. S. BELLAMY, *President.*

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WANTED,

WANT ADS.

Which will appear on this page under the heading "WANTS." They will be classified under the following heads:

HELP WANTED,
SITUATIONS WANTED,
STOCK WANTED,
CAPITAL WANTED,
EXCHANGES FOR SALE,
MATERIAL FOR SALE and
MISCELLANEOUS WANTS.

The rate under these headings will be seven cents per word.

PATENTS and PATENT CAUSES
ALBERT LYNN LAWRENCE,
Attorney and Counselor,
1410 Williamson Building, - Cleveland.
ELECTRICAL PATENT MATTERS A SPECIALTY.
Five years' experience with the Western Electric Co., Chicago.

POSITION WANTED—Myself and wife wish positions, either both at switchboard or myself as manager. Have had experience.
Address A-3, Telephone Magazine.

POSITION WANTED — Telephonist with nine years' practical experience and a technical education, as a manager of exchange or in factory. References.
Address A-4, Telephone Magazine.

POSITION WANTED — As a manager; five years' experience in exchange and two in electric lighting. At present employed by the Bell Company.
Address A-5, Telephone Magazine.

POSITION WANTED — Experienced wireman with some switchboard experience wishes telephone position, any kind, with chance of advancement. Good references.
Address A-7, Telephone Magazine.

FOR SALE — At a bargain, 250 Magneto Bells; some have been in use hardly a year; am changing our system into central energy, so have no further use for them.
Address A-6, Telephone Magazine.

FOR SALE — Unused, paid-up Scholarship, International Correspondence School, for sale cheap.
Address A-8, Telephone Magazine.

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Telephone Magazine

VOL. XVII. CHICAGO, APRIL, 1901. NO. 115.

THE TELEPHONE NEWSPAPER.

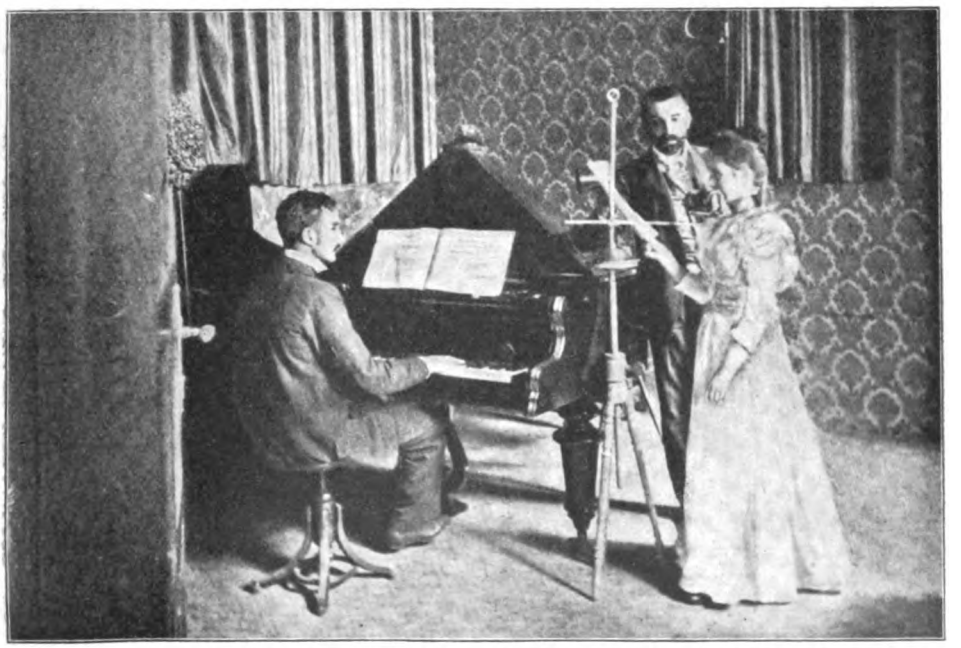
THE "TELEFON-HIRMONDO," OR "NEWSTELLER," OF BUDAPEST — THE DAY'S NEWS TOLD AS IT OCCURS TO 6,200 SUBSCRIBERS SITTING IN THEIR HOMES — A REGULAR PROGRAM, LASTING FROM 10:30 A.M. TO 10:30 P.M.— SUNDAY NIGHT CONCERTS TRANSMITTED TO THE SUBSCRIBERS — A MOST SUCCESSFUL INNOVATION.

BY THOMAS S. DENISON.

By courtesy of *The World's Work*, a monthly magazine devoted to the world's workers. Doubleday, Page & Co., New York city.

We are very apt to claim preëminence for America in the matter of inventions and of novel mechanical applications. But the Hungarians have had for eight years in actual working operation a development of the telephone of which few people in the United States know anything, even by report; the telephone newspaper, or *Telefon-Hirmondo,* as it is called, of Budapest.

For a quarter of a century one of the favorite dreams of the modern prophets has pictured the home equipped with apparatus by means of which one can hear concerts or listen to the latest news, while sitting comfortably by his own fireside. This dream is a fact today in Budapest. Music, telegraphic news, "hot" from the wires, literary criticism, stock quotations, reports of the Reichsrath — the whole flood of matter that fills the columns of our newspapers may be had for the mere lifting of a telephone receiver.



IN THE CONCERT ROOM OF THE TELEPHONE NEWSPAPER.

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I went to Budapest last May, expecting to find this unique "newspaper," of which I had heard so much, rather a fad for a few score of people who had sufficient interest to keep it as a passing diversion. To my surprise I found a great journal with all the equipments of a first-class paper in a very lively city of nearly 600,000 people — all the equipment, that is, except presses, paper and printers' ink. *Telefon-Hirmondo* has 6,200 subscribers. The staff consists of a business manager, an editor-in-chief, four assistant editors and nine reporters.

This novel and interesting enterprise was started about eight years ago by Theodore Buschgasch, who had been interested in electricity and had patented some inventions. Mr. Buschgasch died March 16, 1893, and the present efficiency of the paper in all that pertains to its technic is largely due to Mr. Emil von Szveties, who is known on the staff as technical director. His skill and energy have produced great results. The concern is owned by a stock company with a capital of 600,000 florins (about $250,000).

Telefon-Hirmondo occupies commodious offices on the third and fourth floors of a fine building on one of the finest avenues of Budapest. It divides the entire city into twenty-seven districts, and the main wire runs to each district, with branch wires to the houses. An accurate map of the system hangs in the central office. The company owns its own wires and plant thruout, and has the same right to place wires that is enjoyed by the telephone and telegraph companies.

Twenty-seven copper wires run from microphone receivers in the Opera House to the central office. There the current passes thru a patented device which increases the sound, its distribution to subscribers being regulated by another ingenious contrivance, also patented. The paper has 560 kilometers of wire and 6,200 receivers; that is, one for each subscriber. Its spools may be seen everywhere under the cornices of the houses. The stentor or reader talks into a double receiver or 'phone, and the subscriber has two earpieces like those used by the telephone clerks. The sound of the reader's voice is greatly strengthened by the machine; and by making a receiver in the office the last on the circuit the management may at any time test the working of the wires.

It is most interesting to follow the actual "issue of the paper." A complete program is tacked to the wall above each subscriber's receiver, and a glance at this tells just what may be expected at any hour, every day except Sundays and holidays having the same program. The issue begins at 10:30 A.M. and ends about 10:30 P.M., unless a concert or some other night event is being reported, when it keeps on till later. Stock exchange hours are: A.M., 10 to 10:30, 11 to 11:15, 11:30 to 11:45.

These reports reach subscribers several hours ahead of the evening papers. Quotations are given again in the afternoon, while reports of the Reichsrath and political news occupy the time from 11:45 to 12. When the Reichsrath is not in session the time is filled by fuller reports of general and foreign news. General news of course comes all day at intervals. At 1:30 and 6:30 P.M is a brief *résumé* for those who missed the first news. From 5 to 6 there are concerts, varied by literary criticism, sporting events, and so on. Special items for Sunday are: 11 to 11:30, news; 4:30 to 6, a concert, and every Thursday evening at 6 there is a concert for children. The writer was invited to witness a performance in the concert room of *Hirmondo,* but unfortunately a violent thunder-storm interfered with the use of the wires.

Telefon-Hirmondo is independent in a sense not known in America; it has no leading articles, no editorials, no opinions — unless its short notices of literature and art can come under the last head. The editor alone is responsible in case of action against the paper for libel. He has already had two or three lawsuits, but has won all of them.

The mechanical processes of the paper are about as follows: The news (telegraphic, exchange, specials and locals) is secured by the ordinary methods known in all newspaper offices. The re-

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porter who has finished his assignment writes out his matter in ink and submits it to his chief, who signs it on the margin of the printed form. This signature fixes responsibility. A clerk then takes the copy and carefully copies it with lithographic ink on long galley slips. These are transferred to the stone so as to appear in parallel columns about six inches wide and two feet long. Two pressmen take several impressions on a roller-movement hand press. Common printing-paper is used. Each sheet is submitted to an assistant editor, who, with the aid of a copyholder, exactly as in proofreading, verifies its correctness. This sheet constitutes the file, and a duplicate is cut up into convenient strips for the use of the stentors. Each sheet comprises a certain part of the program, and the whole number of sheets, with hour dates, constitute the day's file.

The stentors are six in number in winter, when the paper is likely to be crowded with important matter, four for duty and two alternates. In summer four suffice. The stentors have strong, clear voices and distinct articulation, and the news comes from the receivers with remarkable strength and clearness. When all six stentors are present, they take turns of ten minutes each; if for any reason only two are on duty, a half hour is the extreme required of one reader.

The only ladies employed on the staff are those engaged in the concerts, and Mr. Horváth called my attention to the fact that in no other newspaper office in the world could be found such a staff.

In answer to my inquiry as to expenses, Mr. Horváth kindly assured me that I was free to investigate. His brief reply was: "We have no secrets." The current expenses are between 9,000 and 10,000 florins per month (a florin is about 42 cents). This includes, of course, interest on the plant. The fixed charges, that is, those which must be met every day — telegrams, salaries, rent, etc.— are about 7,000 florins a month, varying in different seasons. The subscription price per annum is 18 florins, and for 6,200 subscribers that part of the income is easily figured. Advertising receipts, from the nature of

REPORTERS ON THE TELEPHONE NEWSPAPER.

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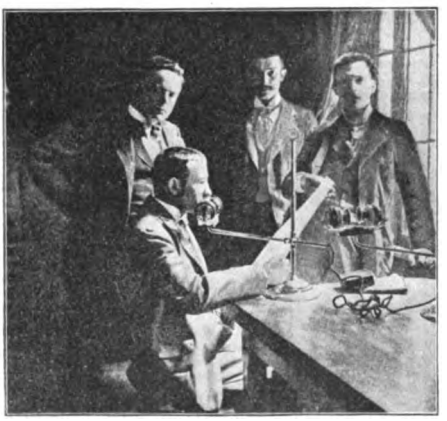
the case, are necessarily limited. It must be a paradise for advertisers, for every man's advertisement must be not only "next reading matter," but actually between items of interest. The charge is one florin for twelve seconds. The paper pays press rates for telegrams. The editor estimates that at the end of ten years the paper will have a valuable plant and privilege paid for, and be able to reduce the price, which is very low now, considering that the telephone in Budapest costs 150 florins per year. To an outsider, the concern appears prosperous. It employs in all about 180



A STENTOR READING TO 6,200 SUBSCRIBERS.

people in winter and 150 in summer. This includes everybody, from office boy, linemen and janitor to chief editor.

Among the prominent subscribers of *Telefon-Hirmondo* are the Prime Minister, Baron Banffy, and all the other members of the Hungarian cabinet; Maurus Jokaí, the famous author; the mayor of Budapest. In fact, the paper appeals strongly to the more intellectual classes, and the capital of Hungary is a very wide-awake, enterprising city.

The "aggrieved subscriber" sometimes wishes to stop his paper, but he can not do this as easily as a subscriber to a printed journal. In the first place, he has had a receiver put into his house at the company's expense and he has been obliged to give security for a year's subscription, one-third of which he pays when the instrument is ready for use. He pays the balance in two equal payments, at the end of four months and eight respectively. If the grievance is real, the editor tries to remove it by means of the soft answer that turns away wrath from the editorial head; if imaginary or absurd, the paper keeps the time-honored waste-basket for its reception. The editors and managers receive the usual courtesies extended to the press in the way of passes and free tickets, and the paper exchanges with the city press. Unknown persons, such as temporary lodgers or boarders in hotels, can not, of course, become subscribers, but the principal hotels do subscribe, and their guests are free to use the instrument.

Hirmondo is at present trying an experiment with "penny-in-the-slot" machines. The coin used is a *20-filler* piece, worth about 2 cents in our money. Music by telephone, whether vocal or instrumental, still leaves something to be desired. The telephone timbre must be got rid of before music can be transmitted satisfactorily. The report of news, however, is highly satisfactory.

So far as a stranger can judge, who is wholly ignorant of the language of the country, the enterprise is distinctly a success. The paper is so well known and has accomplished so much that it appears to be beyond the stage of experiment so far as Budapest is concerned. One strong point in its favor is its early reports. In this respect the paper has a strong hold, for it is able to issue an "extra" at any hour of the day. The plan has so many advantages that we shall probably soon see it in operation on this side of the ocean, with the improvements that Yankee ingenuity will be sure to devise.

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*Yankee ingenuity would improve this telephone newspaper by providing each telephone of any American exchange fitted with a small switch that would cut into the telephone newspaper circuit, which would mean the erection of a common wire for that circuit. When a subscriber wanted the news, all that is necessary would be to move the switch, take up the receiver, and listen to the news; if a call should come in while so occupied, the switch could be so arranged to cut out the news circuit simultaneously with the call. — EDITOR'S NOTE.

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WIRELESSNESS.

BY EDWARD J. WAKEMAN.

MARCONI.

Marconi, the inventor of the wireless telegraph system bearing his name, visits this country for the first time since September, 1899, when he was here superintending the use of his

GUGLIELMO MARCONI.

apparatus in reporting the Columbia-Shamrock yacht races outside of Sandy Hook. When asked as to his plans he said:

"One of the objects of my visit is the establishing of wireless telegraphic stations at points along the coast, so that incoming and outgoing vessels can communicate with the shore from the sea. Among the transatlantic steamship lines the North German Lloyd will be the first to take advantage of my system."

Referring to the use of the wireless apparatus on board warships, Mr. Marconi said plants had been instituted on vessels of the British, German, and Belgian navies. In the British navy twenty-eight vessels are equipped with the system, in the German three, and in the Belgian, four.

"From all these," said Mr. Marconi, "messages can be transmitted successfully from a distance of 200 miles at sea."

"What are the limits of possibility in wireless telegraphy as far as you know them?" he was asked.

"I do not like to speak of the possibilities of it," replied the chevalier. "It is certainly a wonderful thing, but at present I can not speak intelligently of it beyond a distance of, say, two hundred miles."

When asked how he had first turned his attention to the subject of wireless telegraphy, he said:

"I saw an article about eight years ago, in 1893, which stated that Hertz, the great German scientist, had demonstrated that electrical waves could be projected for thirty or forty yards and record themselves on receiving instruments.

"I was fascinated with the idea. I went to work and erected poles on my father's estate, near Bologna. After much trouble I was able to send messages two miles."

"How did you manage to increase the distance so materially?" he was asked.

"After a long time it occurred to me that by connecting one pole of a transmitter and one pole of a receiver to the earth, and the other ends to vertical wires currents would be polarized at right angles to the earth's surface, which, in a measure, left them free to go a greater distance.

"You see," he continued, "if the wires are horizontal, the earth will collect the currents instead of opposing upright wires."

"I am confident the system will ultimately be adopted thruout the world. The fact that several steamship companies have adopted the system, but are unable to utilize it, owing to the absence of receiving stations on shore, has prompted me to attempt to establish stations, both in this country and abroad. You don't hear so much of the system in England, for the reason that it has become established. It is used over there now as one would the telephone or telegraph. America, I think, has been somewhat backward in taking hold of the matter.

"Even the Boers attempted to use the apparatus. Forty instruments were seized by the government authorities at

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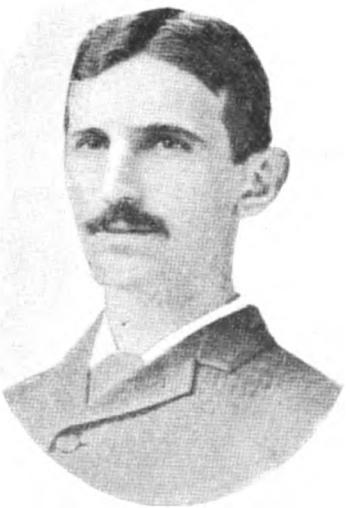
Cape Town, but on trial they would not work. They were German imitations of the Marconi system."

When informed of a scheme for telegraphing across the ocean without wires by means of big poles, he said:

"Why, there is a great wall of water, many miles in height, between this country and Europe, and poles high enough to counterbalance the curvature of the earth for such a distance would be an impossibility, even if such an object were desirable."

TESLA.

Nikola Tesla himself has announced that his system of wireless telegraphy would be at the world's service in about



NIKOLA TESLA.

eight months and that some of the machinery is now being constructed, and for the rest of it contracts will soon be awarded.

Just where the first wireless telegraph office will be opened in New York, Tesla does not care to tell at present. As for the financial end of the enterprise, that has been privately arranged, and the inventor was most enthusiastic today in his veiled references to the financial assistance he has received.

In telling of the satisfactory outcome of his work on his wireless telegraph system and of his future plans in regard to putting it to commercial use, Mr. Tesla made the following statement:

"Three distinct experimental evidences of the practicability of my plan were obtained, each of which would have been sufficient to inspire me with confidence of success. One of these evidences was my discovery of the stationary electrical waves in the earth, which I have already published and which demonstrates in a positive manner that vibratory currents can be transmitted thru the terrestrial globe just as thru a wire to the greatest distances.

"Another evidence I obtained by ascertaining the law of variation of the intensity of the effects produced by my transmitter at a distance, which enables me to design the transmitting apparatus for the required performance, just as I can construct a dynamo or steam engine for a given output.

"The third evidence I obtained by actual measurements of the intensity of the effects thru varying distances of from 650 to 700 miles, and this was what may be considered the proof of the pudding.

"One great trouble was to perfect methods for securing complete privacy and non-interference of messages, for only after this was assured could I hope to make a wireless transmission to great distance a practical success. These have now been so far perfected that the same privacy is practicable as in transmission over a private wire.

"Another feature of great importance in the commercial exploitation of the system was the simultaneous transmission of a number of messages by the same apparatus, and in this direction I was fortunate enough to find a happy solution."

"What must a company operating with your system have in order to transmit messages, for instance, from New York to London?" was asked.

"The stations at either side will have to have a transmitting and receiving apparatus. The essential part of the transmitter is a circuit, which is connected to the ground at one of its ends and to a conducting surface at the other end, and which is carefully adjusted so

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as to respond freely to the vibrations of the primary source of currents. Under these conditions currents of enormous intensities are produced in the circuit, which pass away thru the ground in all directions, which spread, in ever widening circles, over the surface of the sea.

"Suppose the transmitter in New York is controlled by the key of the operator. Each time he depresses the key these ripples spread over the globe and reach London, where a receiving circuit arranged and connected similarly of several hundred of his receivers only the right one will respond to a transmitter.

There are two apparent points of difference between the Marconi and Tesla systems. The young Italian relies upon the ether to convey his messages, while Mr. Tesla employs the earth as a conductor.

Then the particular form of energy employed by Marconi and Slaby is believed by them to be the so-called Hertz waves, which are not electricity, tho produced by electrical apparatus.

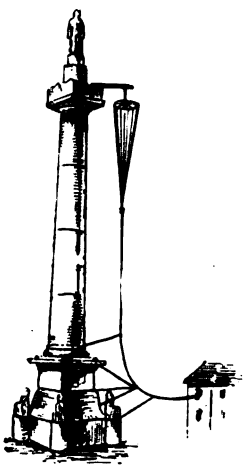

FIG. 1.—BRUSSELS.

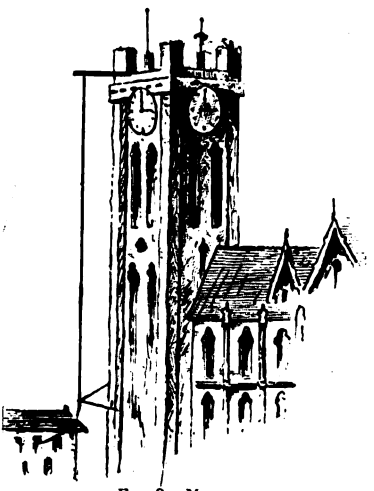

FIG. 2.—MALINES.

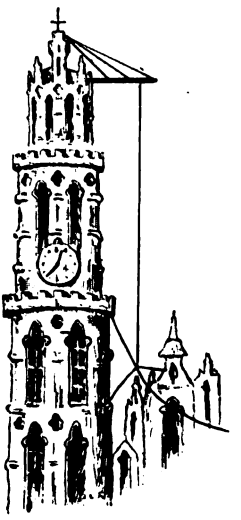

FIG. 3.—ANTWERP.

WIRELESS EXPERIMENTS OF M. GUARINI.,

may be located. This receiving circuit is tuned with the greatest care to the vibrations of the transmitter."

The advances which Mr. Tesla says he has made within the last year or two consist of the improvement of power of his generating devices and in the perfecting of his receivers, which are so designed as to respond only to messages intended for them. Mr. Tesla insists that he has developed the "tuning" system far beyond the possibilities reached by any one else, and he hopes to carry it still further. He doubts, for instance, whether Marconi could permit more than six or eight receivers in the range of a transmitter without more than a single instrument picking up a message, but Mr. Tesla believes that out Mr. Tesla, on the other hand, utilizes true electric waves, of high frequency. Meantime Marconi has practical instruments in daily operation sending messages across sixty miles of air, while Tesla is going to send fifteen hundred words a minute thru fifteen hundred miles of earth.

GUARINI.

M. Guarini is still carrying out his experiments between Brussels and Malines, a distance of thirteen and a half miles, and from there to Antwerp, fourteen miles. We are indebted to the London *Electrician* for a most interesting account of M. Guarini's experiments. On February 8 he made tests between the Colonne du Congrés, at

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Brussels, and the cathedral of St. Rombaut, Malines, as before, but on this occasion he took the latter point as a transmitting station. He used the same apparatus as before, but his air-wires were different. Since his last experiment storms have broken these, and he now profited by this circumstance to make experiments with a different type of air-wire.

At the transmitting station (Malines) he used the ordinary air-wire with a single cable, but at the receiving point the cylinder of 50 metallic wires of 4mm. diameter which formerly constituted the upper part of the air-wire was replaced by a cone whose apex was turned toward the ground and connected to earth by a single cable. The cone was formed by 50 wires 0.4mm. diameter. The single cable leading from the ground to the apex of the cone extended right thru the cone axially to the top of the air-wire. This arrangement is sketched in Fig. 1. At first communication was bad, M. Guarini only receiving at Brussels a very small part of the signals transmitted from Malines, while communicating in the inverse direction he received at Malines all the signals transmitted at Brussels. An analogous effect, he says, had already been observed last year in Paris when telegraphing without wires between the Eiffel Tower and the Panthéon, when it was found that the tower acted very well as a transmitter but gave no results as a receiver. He attributes this to the presence of metallic masses on the monument—the bronze statue of Leopold I. at the top, the metal balustrade round the platform, the bannister of the staircase in the interior of the column, the statues at the base, etc. Only on doubling the source of electrical energy at Malines and employing an extra sensitive Blondel coherer at Brussels could he obtain irreproachable transmission. He also found that, other things being equal, the maximum effect was obtained if the air-wires were so placed that the vertical plane connecting them or its prolongation did not meet the column and spire to which the wires were attached (see Fig. 4). Other experiments show that the sensitiveness of a coherer for a particular wave increases on diminishing the local current in its circuit by using appropriate resistances.

Finally he made experiments to determine the importance of the earth connection. As might be expected, if neither of the stations were connected to earth, or if the receiving station only was connected to earth, no good signals could be transmitted, but with the ordinary earth connection at the transmitting station he found the results better when the receiving wire was not connected to earth than when it was. M. Guarini thinks the explanation of this is that earthing one of the balls of the oscillator increases the potential of the ball connected to the air-wire, and determines the position of a point of maximum vibration at the summit of the transmitting wire — i. e., at the part most in sight of the receiving wire, while, on the other hand, by insulating the coherer one forms a maximum vibration at the point of the receiving air-wire where the coherer is inserted. He concludes that the earth acts as a large capacity and not as a conductor, this large capacity being advantageous to the transmitter, but harmful in the case of the receiver.

1—Saint Rombaut Cathedral; 2 and 3—Air Wires; 4—Colonne du Congres

FIG. 4.

On February 12th, M. Guarini experimented between Malines and Antwerp. The transmitting station at Malines was at the cathedral of St. Rombaut, as before, and at Antwerp the tower of the church of Notre Dame was employed. The same apparatus was used as in the previous experiments. Simple air-wires were adopted, without capacity at their upper ends. Figs. 2 and 3 show the air-wires at Malines and Antwerp. Difficulties were encountered, owing to the more or less pyramidal shape of the tower of Notre Dame. M. Guarini made up a sort of fishing rod, composed of three pieces of bamboo cane, jointed with metal rings, and fastened this securely on the third gallery. At the

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extremity of this rod a ring of 7 wires 0.9mm. diameter was fixed, which descended in as nearly a vertical direction as possible to the height of the roof, i. e., about 40 meters from the ground (the third gallery is 106 meters above the ground, or 112 meters above sea level). From this point the wire was slanting to the receiving apparatus, which was placed in a neighboring house. The coherer was of the Blondel pattern, and the earth-wire was formed by three metallic wires connected to a street lamp-post.

Between the two air-wires were the groups of houses in Malines and Antwerp, some villages and castles, and undulations from 5 meters to 30 meters in height. With current from 2 to 2½ amperes at the transmitting station, good results were obtained.

On removing the earth connection from the receiver, however, the results were not so good as those between Brussels and Malines. M. Guarini attributes this to the absence of the capacity in the upper part of the receiving air-wire in the present case.

Another interesting observation is worth recording. The oscillator at Malines was removed and the air-wire connected to one terminal of the secondary of the induction coil, the other terminal of the secondary being earthed.

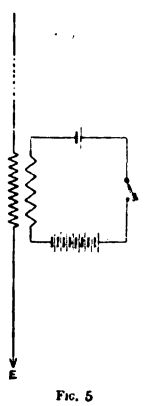

FIG. 5

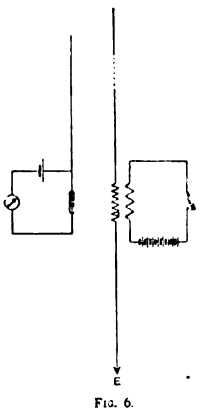

FIG. 6.

With these connections (Fig. 5) 12 signals were transmitted, three of which were clearly received at Antwerp. This, M. Guarini points out, constitutes wireless telegraphy in accordance with Edison's American patent 465,971 of 1891, with the difference that the receiving apparatus included a coherer. On removing the earth connection from the coherer (Fig. 6) in this case also signals were still received.

Signals could also be received with the transmitter connection of Fig. 5. In this case it was an advantage to add a capacity at the top of the air-wire.

SLABY.

Much of the credit of the evolution of wireless telegraphy is due to Professor Slaby, of Charlottenburg, Germany, and his collaborator, Count Arco, who have from systematic investigation of the phenomena of Hertzian waves, formulated laws governing these phenomena. They have proved that much which was formerly considered indispensable in the ethereal transmission of electrical waves has been shown to be not only unnecessary, but even disadvantageous. For instance the balloon at the upper end of the transmitting wire, supposed to serve the purpose of increasing the capacity; the peculiar plates at the receiving station, formed like butterfly wings, and likewise designed to increase the capacity; the careful insulation of the receiving wire from the earth; and the formerly accepted law that the distance to which messages can be transmitted is proportional to the square of the length of the transmitting and receiving wires. That there is a definite relation between distance and length of wire or height of mast may well be assumed; but that relation plays no important part in Slaby's system, since the tension to which the coherer is subjected is augmented by means different from those hitherto known.

The waves sent forth by a transmitter loop are amplified by a condenser. An induction coil is connected with the upper end of the loop, and is so wound that it permits the passage of low-frequency currents, but checks the high-frequency currents generated by the discharge of the condenser. At the moment of discharge the loop acts as a single vertical wire. By varying the nature of the induction coil and the condenser, waves of any length can be sent

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forth. At a lecture delivered before the German Emperor, waves varying in length from 140 to 600 meters were utilized.

In direct opposition to Marconi, Slaby grounds his receiving wire. An ordinary lightning rod is used instead of a mast. If the length of the receiving-wire be exactly one-fourth the wave length, a node is formed at the connecting point with the earth, and the maximum amplitude of the alternating tension appears at the upper end. The coherer should be attached to the point of greatest amplitude; but such an arrangement is impossible in practice. The difficulty is very simply and ingeniously overcome by connecting with the receiving-wire at the earth node a horizontal auxiliary wire of equal length. At the free end of this horizontal wire the wave-amplitude is equal to that of the upper end of the main wire. To the free end of this auxiliary wire the coherer is attached. The auxiliary wire need not be extended in a straight line; it can be wound to form a coil.

If the main receiving-wire, which is usually a lightning rod, and which cannot, therefore, be readily lengthened and shortened, be subjected to the action of electrical waves of greater length than the wire can receive, it is necessary merely to lengthen the auxiliary wire in order to receive the message. In this manner a nodal point can be formed in the auxiliary wire, so that the receiving wire may be subjected to electrical impulses by which it would not otherwise be influenced. The auxiliary wire in Slaby's system is of the utmost importance; for by its use the receiving apparatus will be affected only by certain waves. Thus Professor Slaby has succeeded in overcoming the impossibility of secretly transmitting a message.

In order to increase the effect of the waves, a peculiarly wound induction coil is placed in the circuit between the coherer and the auxiliary wire. The coil Professor Slaby terms a "multiplier." By means of this instrument, a trustworthiness and certainty of operation have been attained which are gratifying.

(*To be continued.*)

THE TELEPHONE IN SURGERY.

The war in South Africa has led to a novel and singular use of the telephone in surgery. The telephone makes possible the certain location of projectiles within the human body, and, furthermore, enables their removal with the least possible danger to the patient. The description of a few cases which an English army surgeon treated with the application of the "telephone probe," invented by Dr. Treves, serves best to show the great value of that instrument.

A Mauser bullet had entered a soldier's back, pierced the stomach and lodged right in front of the latter. When breathing deeply the patient suffered great pain, and it was found that the removal of the projectile offered great difficulty. As in the operation pincers had to be employed, the telephone probe was selected for that purpose, the special utility of that instrument being based on the fact that when the pincer-like ends of the probe close over a metal body a noise is heard in the telephone. The surgeon soon got hold of what he thought was the bullet, but it resisted his attempts to draw it out. His assistant, who held the telephone, could hear no noise in it, and it was therefore clear that the bullet had not yet been reached.

Then the probe was pushed in further, and the telephone gave its note of warning and the removal of the projectile was easily effected. If this new apparatus had not been employed the patient would probably have suffered severe internal injury before the surgeon's discovery of his mistake.

In another case, where the bullet had entered the shoulder, the probe first got hold of what seemed to be the projectile, but afterward proved to be a tendon. Only the failure of the telephone to emit any sound deterred the surgeon from giving a vigorous pull and thus doing great and permanent injury. There can be no doubt that the telephone renders excellent service in the removal of deeply lodged projectiles, and that the introduction of the device in the surgical department of all armies must be considered an imperative necessity.

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PUPIN ON WAVE TRANSMISSION OVER CABLES.

Discussion at the American Institute of Electrical Engineers at Philadelphia.

The President: Seven years ago the electrical fraternity was startled with a paper on Ocean Telephony. But seven years have passed and we have not yet telephoned across the ocean. The present paper differs from this other one, which was read by an Englishman, in that, in the first place it makes no such extravagant claims as ocean telephony, and in the second place it verifies, by actual experiment, the application of a very interesting theory. Papers like this, and the preceding one, show what good results can be accomplished by a careful and intelligent application of correct theory. Such papers reflect great credit on the Institute. The paper is now open for discussion.

Mr. Steinmetz: Mr. President, I have been very much pleased to listen to this highly interesting and extremely important paper, which marks a decided advance in the art of telephony, as I believe. Now, coming first to a comparison with previous propositions for improving the method of telephony over cables, there is an essential difference between the present case and the previous ones. In the latter, if I remember rightly, it was proposed to distribute inductances along the cable, these inductances to be shunted across the cable. The capacity of the cable and the static capacity act as a shunt across the line. If you want to compensate for the effect of capacity by self-induction, or self-induction by capacity, one must be in shunt and the other in series. That is to make up for the electrostatic capacity of the cable. That is the case here. The phase relation and frequency will remain the same thruout the whole line. This was not the case with the previous proposition. The problem of transmitting alternate currents leads to two very distinct phenomena and problems, that of transmitting very large powers at very low frequency relatively, and high voltages, with the so-called electric power appliances, and then the transmitting of very small powers at very high frequencies at very low voltage. That is telephony. The theoretical aspect of the problem is the same, but they have to be conducted entirely different. The solution of the problem in the one case is entirely inapplicable to the other case. Theory has to go ahead of investigation, except by mere luck in an individual case you find a solution, and in the next case you reach the same solution and it is entirely wrong. We have found means to compensate for the effect of self-induction by synchronous apparatus. Self-induction is not an objection any more; it is rather an advantage. We have a similar problem in the system of telephony, only there it is not the self-induction which is very small in the ordinary telephone, at the frequencies and voltages in current use, but it is the capacity which is the dangerous objection. The attempt to use the solution which is satisfactory in power transmission would not be fair because the two conditions are entirely different. The shunt across is entirely unsatisfactory and makes the problem worse, it spoils what little transmission of speech we can get. In America we have investigated the transmission at very high voltages and at relatively low frequencies. There is a certain value in self-induction but it is not at all essential in most cases to have exactly this value. You can get half as much and still the transmission is very much improved over what it would be without the self-induction. The more you put the self-induction in the better it becomes.

Referring to the second part of the paper, the mathematical side, I have not read it yet, so I can not say anything about it. If any further suggestions occur to me I shall communicate them in writing.

Dr. Crehore: Mr. President, I would like to make one inquiry. It occurs to me that in looking up the proportions to form a distortionless circuit the value of i or the reduction required is invariable; that if you were to send a sine wave into the cable the energy that you get thro is necessarily very much reduced from what it would be without the induction. I would like to ask Dr. Pupin for a comparison of the amount

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of energy that he gets thru this 250-mile cable by sending a constant voltage, say of thirty to fifty volts. I would like to form a comparison between the amount you get thru the cable when you have those coils in, and when you do not, because it seems to me very important as to the distance that you will be able to cover.

Dr. Pupin: The ratio is 1 to 10,000.

Dr. Crehore: The ratio between the energy you would receive and otherwise?

Dr. Pupin: Yes. By making a certain arrangement you can get it constant within practical limits. In this particular case the ratio of the current put in at one end and the current received at the other end is 50 to 1. Two per cent of the current that is put in at one end is received at the other end when you put the coils in, and of course that is all that is needed for telephony over that length. If you did not have the coils in, instead of 1 to 50 you would have 1 to 125,000.

Dr. Crehore: You mean you would get a larger amount with the coils in?

Dr. Pupin: Yes; very much larger. I say 1 to 125,000. I could not get any current thru at the other end at all that I could detect with the telephone. I believe you do not get anything thru to speak of.

Dr. Crehore: Sending a simple sine wave?

Dr. Pupin: Sending a simple sine wave by means of the alternator; that is, using about 15 volts at one end. This calculation refers to about 625 periods per second.

Prof. Franklin: What is the condition of this circuit with regard to the distortion?

Dr. Pupin: The attenuation constant is the same for all frequencies, and therefore the circuit is distortionless. If there was any difference at all in the relation between the attenuation and the frequency I did not notice it.

Prof. Franklin: You did not take precaution beforehand to satisfy the conditions.

Dr. Pupin: Yes. I did not want any distortion. I could have detected it experimentally up to about two per cent on an average. Up to that limit there is no dependence between the frequency and the attenuation. If it is anything less than two per cent it does no harm.

Mr. Steinmetz: Since they have been speaking of distortion, I desire to sound a note of warning. As I said before, the solution in telephony is entirely different from that in power transmission at low frequency. That does not mean that the proper method of alternating current transmission is to put in as much capacity as to make it distortionless. Take a telephone cable and impress it with the ordinary electromotive force; then you will require a very large impressed power to get the same current out of the cable without inductance.

Dr. Pupin: I would like to correct a statement which our worthy president has made. It is not an error on his part, but rather a misunderstanding. He said I did not make a claim to telephony on an ocean cable. I do decidedly make that claim.

The President: You did not make the claim in the paper.

Dr. Pupin: I did not make it in this paper, because I reserved it for another paper which I expect to bring very soon before this Institute, in which I shall discuss the cable problem in all its details. But I do now state decidedly that I am convinced that telephoning over a cable of reasonable length, say 1,000 miles to start with, is quite possible and nothing at all extraordinary.

Prof. Franklin: I would like to ask Dr. Pupin a question, and that is, why not apply this method which you have been working upon to simply increasing the possible speed of telegraphy? It applies to that equally with telephony. Why telephone across? Why not apply it to increasing the speed of signaling?

Dr. Pupin: That goes without saying. It will help telegraphy as well as telephony. Of course it would increase the speed of telegraphy. You can take a distortionless loaded conductor like the one described in this paper and transmit five or ten different messages over the same wire. That would be even more important than telephony, but I don't know that it would be as interesting from a scientific point of view.

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The President: When I said that Dr. Pupin did not make any claim to ocean telephony I meant to compliment him; I meant to say that he claimed no more than what he had really accomplished, and that it was in this that his paper differed very radically from the other one to which I referred. Concerning ocean telegraphy, or at least transatlantic telegraphy, it should not be forgotten that in telephoning east and west there is another factor which enters — that the business days in London and New York, for instance, differ by five hours and do not overlap for a sufficient length of time to make it pay to have a cable for telephoning across the Atlantic unless such a cable could also be used at other times for telegraphing. To simply have a cable for telephony I am afraid would hardly pay, because the time of utilization would only be about two or three hours out of the 24. This does not apply to telephoning north and south.

Dr. Crehore: I would like to inquire whether I am anticipating too much to ask Dr. Pupin whether he is prepared to show a form of cable which he could put such coils into or indicate how a cable is to be constructed for submarine work, or whether he chooses to reserve that for the paper which he intends to present in the future?

Dr. Pupin: No; it is no secret. I did not talk about it, because I have not yet sufficient experimental data on that particular form of cable, but it is a cable of the same kind as the one discussed in this paper. There is only this distinction, and it is only a distinction in degree and not in principle at all. I said a little while ago that on a land line of 2,000 miles, say between here and New Orleans, if you wanted to introduce coils at a distance of two miles it would be sufficient, but if you have a cable where the capacity is large, the coils have to be placed at much smaller distances apart. I made a calculation for a particular form of cable, say three-tenths of a microfarad per mile and four ohms resistance per mile, and in order to give the cable a sufficiently small attenuation constant for 750 periods I introduced inductances so as to give three-tenths of a henry per mile. I made the reactance coils smaller. I wound the core two inches and a half external and one inch internal diameter and six inches long with very fine iron wire. That is where the whole trick comes in—to have fine wire. It is necessary to have iron wire two mils in diameter. I am informed by some manufacturers of iron wire in Worcester, Massachusetts, that they would fill such an order if I wanted it at once. This is very fine Swedish iron wire. They can draw it very easily down to two mils diameter. You wind two coils in inductive relation to each other, each 40 turns, copper wire, and then you place them eight coils per mile. That is at a distance of between 600 and 700 feet apart. Coils like that can go right into the sheathing of the cable. It is all a question of Foucault current losses in the iron. The Foucault current losses can be reduced to a very small amount. I calculate that 25 coils like that, with a frequency of 750 periods, would be equivalent to adding one ohm to the line. So that form of cable is a practicable form. Instead of having them 700 or 800 feet you can make them a little more frequent.

Mr. Hommel: It appears to me that the main point just at present is to see whether it is practicable to telephone for any such distance thru the capacity of an ocean cable and resistance, and if it is, the working out would be a matter of detail. Even if the coils could not be made in just this manner, it appears to me it would not matter. If they were a little larger there could be some mechanical arrangement devised so as to take the strain off the coils, and while this arrangement as well as the other would undoubtedly make the cost of manufacturing the cable higher, probably the income from being able to telephone across would warrant the expense; and it appears to me the main point would be to find out whether it is practicable to telephone any great distance over an ocean cable by means of self-induction added at intervals as shown.

Dr. Pupin: But one more remark. Nobody cares so much for ocean tele-

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phony anyhow. It is not so very important. It is very interesting from a purely scientific point of view, but whether it is of so very great commercial importance I am not prepared to say. I am rather inclined to think the other way. I think telephony on land lines is the point. We have reached the limit of telephony over land lines. We can not telephone over 1,000 or 1,200 miles with any sort of satisfaction. The telephone men themselves tell me that it is a somewhat unsatisfactory business to telephone between St. Louis and New York. You have got to repeat your sentences very often. The lines are too expensive. The circuit between New York and Chicago costs for copper alone $250,000. Now, supposing you wanted to extend the limit of telephony and wanted to go to San Francisco or to Kansas City, unless you spend four or five times as much per mile on the circuit you can not telephone at all. Then you have other considerations—the weight of the wire, etc.—and according to the views of the telephone men themselves, it is impracticable to carry on the telephone business over a distance longer than 1,200 miles. By spending a few dollars for these coils, at proper distances apart, I would undertake to build a line between New York and New Orleans, altho I am not a practical engineer, and I do not care so very much for commercial work, but just for the sake of showing what could be done I would undertake to build a line between New York and New Orleans that would be four ohms per mile; that is twice the resistance per mile of the standard wire between New York and Chicago. I think that this is the really important problem — the problem of extending the limit of telephony over land lines.

PUPIN'S PATENT PUT TO TEST.

Florida is to be connected with Cuba by an undersea telephone line. The termini of the line have not been announced, but it is stated that the Bell Telephone Company has determined to construct it, applying the invention of Dr. Michael I. Pupin, from whom the company purchased it. An advantage of the invention is the saving in wire, by the use of Dr. Pupin's steel wire system, which will be, it is said, $120 a mile. The whole invention is based on the principle of equivalents between nonuniform and uniform conductors of large electromagnetic reaction.

WHAT HAPPENS IN LONDON.

The London, Eng., *Electrical Engineer* in reporting a general meeting of the shareholders of the National Telephone Company, gave the following statement of the chairman, Mr. J. Staats Forbes: "The business of the year, taken as a whole, had created a record, and that notwithstanding some very adverse circumstances. The Government had now become their competitors in London; they had the power to grant licenses outside the metropolis, whereas the company had a short life — 1911 was the end of their license. What was going to arise in 1911? No one could tell. The Government under the license could every seventh year take over the concern by arbitration. If the Government persisted in competing with the company at very low rates, he was afraid they would have a sorry tale to tell in 1904. After much deliberation and great individual anxiety on the part of the directors, they had come to a conclusion — subject to the sanction of the shareholders — to go on; to relax no reasonable effort to increase their subscribers, and to make the best of their property. Taking the year as a whole they had erected 23,490 additional exchange and private lines. Of those 16,776 had been for subscribers on a message-rate system — namely, the payment of a low annual charge in respect to the cost of installation, and the addition of 1d. for each call made. He understood the Government intended to promote and extend that system. Well, he wished them joy if their result was to be anything like this company's under it. On an outlay of half a million of money they had not made one farthing of interest. The company or municipality could not afford to give services of that kind for nothing.

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EDUCATIONAL COURSE IN TELEPHONY.

BY A. J. KUSEL.

In beginning this educational course, we will write it in as plain and simple language as it is possible for one to express the terms of telephony. This course will differ from other courses that have appeared in that it will be conducted on practical lines thruout. It will run for one year in the TELEPHONE MAGAZINE. Any questions directed to the Educational Course Editor will be answered by note in the following issue.

The first part of this course will be taken up in explaining the different terms and units of electricity as used in telephony, together with the first of the battery papers. Part two will finish the battery papers. Part three, telephone transmitters, showing all the different kinds of transmitters, explaining their action, and exploiting what is undoubtedly the proper theory of a transmitter. This part will be fully illustrated with the drawings of all the different transmitters, from the first experimental devices to all the leading transmitters in use at the present time.

The succeeding month's study will always be announced in the current issue.

An OHM is the unit of resistance. It is meant to show electrical stress so it can be figured in numerals. Its relation to a simple form can be had in the following manner: Let us take a piece of pipe with a half-inch hole and force one cubic foot of water thru it. Then let us take the same length of pipe with a sixteenth-inch hole thru it. Now let us force a cubic foot of water thru the smaller pipe and we find that it will require eight times the amount of pressure to force the water thru the small pipe as it does thru the large one, or if we were to merely allow them to flow thru by gravitation we would find that it takes eight times as long for the water to flow thru the sixteenth-inch bore as it does for the water to flow thru the half-inch bore, and we find if we diminish the size of bore we increase the resistance. So it is in electricity and an OHM expresses the amount of resistance. This rule is one of the fundamental ones that are in constant use.

A VOLT is a unit of electricity and represents pressure. Explaining this in the same manner and referring back, we take the same form as in expressing the ohm. We find that it takes eight times the amount of pressure to get the water thru the small pipe as it did the large one. It will take eight times the number of volts to get a current thru a small wire than one eight times larger, so we see how these two terms bear a relation to each other.

An AMPERE is a unit of electricity and represents quantity or an amount of current. The ampere is similar to the quantity of water. That is, let the pipe be now known as a piece of wire, the one with a half-inch bore be a wire a half-inch in diameter and the one with the sixteenth hole to be a sixteenth-inch in diameter, we will find that it will take a greater number of volts to get ten amperes across the small wire than the large one and for that reason there is more ohms resistance in the small wire than in the large one. You may by the medium of induction increase your voltage at the loss of amperes or vice versa. This will be explained in the fourth paper. As we have a little understanding on the simple units we now look up the resistance of the different sizes of wires, together with their length per pound.

(See table No. 1, next page.)

We will have frequent cause to refer to this table later, but as we will proceed from the ground up, we will now start in and describe the different batteries. An electric battery, or cell, as a single element is called, is a device for the conversion of the potential energy of chemical separation into the energy of an electric current.

Thus the metal zinc on which sulphuric acid acts chemically represents energy of chemical separation in the potential form. If now the zinc is placed alone in the acid, this energy of chemical separation is converted simply into heat, and in the chemical change the zinc displaces the hydrogen of the acid with the formation of zinc sulphates. But if the displacement of hydrogen by zinc is made to take place under certain less simple conditions, then a part at

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STANDARD COPPER WIRE TABLE.

This table is computed for bare wire, which should be remembered.

A. W. G.	DIAMETER.	AREA.	WEIGHT.		LENGTH.		RESISTANCE.	
B. & S.	Inches.	Circular Mils	Lbs Per Foot	Lbs. Per Ohm.	Feet Per Lb.	Feet Per Ohm.	Ohms Per Lb.	Ohms Per Foot.
0000	0.460	211,600.	0 6405	13,090.	1.561	20,440.	0.00007639	0.00004893
000	0 4096	167,800.	0.5 80	8.232.	1.969	16,210.	0.0001215	0.00006170
00	0.3648	133,100.	0.4028	5,177.	2.482	12,850.	0.0001931	0.00007780
0	0.3249	105.500.	0.3195	3 256.	3.130	10,190.	0.0003071	0.00009811
1	0.2893	83.650.	0.2513	4,048.	3.947	8,083.	0.0004883	0.0001237
2	0.2576	66.370.	0.2009	1,288.	4.977	6,410.	0.0007765	0.0001560
3	0.2294	52.630.	0.1593	810.0	6.276	5,084.	0.001235	0 0001967
4	0.2043	41,740	0.1264	509.4	7.914	4.031.	0.001963	0.0002480
5	0.1819	33.100.	0.1002	320.4	9.980	3,197.	0.003122	0.0003128
6	0.1620	26.250.	0.07946	201.5	12.58	2,535.	0.004963	0.0003944
7	0.1443	20,820.	0.06302	126.7	15.87	2,011.	0.007892	0.0001973
8	0.1285	16,510.	0.04998	79.69	20.01	1,595.	0.01255	0.0006271
9	0.1144	13.090.	0.03963	50.12	25.23	1,265	0.01995	0.0007908
10	0.1019	10 380.	0.03143	31 52	31.82	1,003.	0.03173	0.0009972
11	0.09074	8.234.	0.02493	19.82	40.12	795.3	0.05045	0.001257
12	0.08081	6,530.	0.01977	12.47	50.59	630.7	0.08022	0.001586
13	0.07196	5,178.	0.01568	7.840	63.79	500.1	0.1276	0.001999
14	0.06408	4,107.	0.01243	4 931	80.44	396.6	0.2028	0.002521
15	0.05707	3,257.	0.009858	3.101	101.4	314.5	0.3225	0.003179
16	0.05082	2.583.	0.007818	1.950	127.9	249.4	0 5128	0.004009
17	0.01526	2,048.	0.006200	1.226	161.3	197.8	0.8153	0.005055
18	0.04030	1 624.	0.004917	0.7713	203.4	156.9	1.296	0.006374
19	0 03589	1,288.	0.003899	0.4851	256.5	124.4	2.061	0.008038
20	0.03196	1,012.	0.003092	0.3051	323.4	98.66	3 278	0.01014
21	0.02846	810.1	0.002452	0.1919	407.8	78.24	5.212	0.01278
22	0.02535	642.4	0.001945	0.1207	514.2	62.05	8 287	0.01612
23	0.02257	509.5	0.001542	0.07589	648.4	49.21	13.18	0.02032
24	0.02010	404.0	0.001223	0.04773	817.6	39.02	20.95	0.02563
25	0.01790	320.4	0.0009699	0.03002	1,031.	30.95	33 32	0 03231
26	0.01594	254.1	0.0007692	0.01888	1,300.	24.54	52.97	0.04075
27	0.0143	201.5	0.0006100	0.01187	1 639.	19.46	84.23	0.05138
28	0.01264	159.8	0.0004837	0.007466	2,067.	15.43	133 9	0.06479
29	0.01126	126.7	0.0003836	0.004696	2,607.	12.24	213.0	0.08170
30	0.01003	100.5	0.0003042	0.002953	3,287.	9.707	338.6	0.1030
31	0.008928	79.70	0.0002413	0.001857	4.145.	7.698	538.4	0.1299
32	0.007950	63.21	0.0001913	0.001168	5,227.	6.105	856.2	0.1638
33	0.007080	50.13	0.0001517	0.0007346	6,591.	4.841	1,361.	0.2066
34	0.006305	39.75	0.0001203	0.0004620	8.311.	3.839	2,165.	0.2605
35	0.005615	31 52	0 00009513	0.0002905	10,480.	3.045	3.441.	0.3284
36	0.0050	25 0	0.00007568	0 0001827	13,210.	2.414	5,473.	0.4142
37	0.004453	19.83	0.00006001	0.0001149	16 660.	1.915	8.702.	0.5222
38	0.003965	15.72	0.00004759	0.00007210.	21 010.	1.519	13 870.	0.6585
39	0.003531	12.47	0.00003774	0.00004545	26,500.	1.204	22 000.	0.8304
40	0.003145	9.888	0.00002993	0.00002858	33,410.	0.9550	34.980.	1.047

EXPLANATION OF TABLE.

The data from which this has been computed are as follows: — Matthiessen's standard resistivity, Matthiessen's temperature coefficients, specific gravity of copper — 8.89. Resistance in terms of the international ohm.

Matthiessen's standard 1 metre-gramme of hard-drawn copper — 0.1469 B. A. U. @ 0° C. Ratio of resistivity hard to soft copper 1.0226

Matthiessen's standard 1 metre-gramme of soft-drawn copper — 0.14365 B. A. U. @ 0° C. One B. A. U. — 0.9866 international ohms

Matthiessen's standard 1 metre-gramme soft-drawn copper — 0.141729 international ohm @ 0° C.

Temperature coefficients of resistance for 20° C., 50° C., and 80° C., 1.07968, 1.20625, and 1.33681 respectively.

1 foot — 0.3048028 metre. 1 pound — 453 59256 grammes.

Although the entries in the table are carried to the fourth significant digit, the computations have been carried to at least five figures. The last digit is therefore correct to within half a unit, representing an arithmetical degree of accuracy of at least one part in two thousand. The diameters of the B. & S. or A. W. G. wires are obtained from the geometrical series in which No. 0000 — 0.4600 inch, and No. 36 — 0.005 inch, the nearest fourth significant digit being retained in the areas and diameters so deduced.

It is to be observed that while Matthiessen's standard of resistivity may be permanently recognized, the temperature coefficient of its variation which he introduced, and which is here used, may in future undergo slight revision.

F. B. CROCKER, W. E. GEYER,
G. A. HAMILTON, A. E. KENNELLY, Chairman,
Committee on "Units and Standards."

TABLE No. 1.

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least of the energy developed takes the form of an electric current. The arrangements of parts necessary to secure these conditions, which determine that the transformed energy shall be electrical, is called a battery or voltaic cell.

A voltaic cell, in giving out energy, liberates gases formed by the chemical changes. One of these gases is hydrogen.

Hydrogen is one of the elements of water and can be generated in a great many different ways. It is a non-conductor of electricity and is mostly liberated from the negative pole of a battery or cell. Oxygen is another one of the elements of both air and water. This gas is also a non-conductor of electricity. Nitrogen is one of the elements of air, and is a partial conductor.

We show here the specific gravity of the different gases. As temperature will also play an important part a comparison of thermometers is reproduced. We will have a great deal of use for all these tables in reference to batteries.

GASES.

	Compared to water.	Compared to air.
Air	0.001 292 8	1.
Oxygen	0 001 429 3	1.105 63
Nitrogen	0 001 255 7	0.971 37
Hydrogen	0.000 089 54	0 069 26
Carbonic dioxide	0.001 976 7	1.529 1
Mixed gases from electrolysis of water	0 000 536 1	0.414 72

TABLE NO. 3.

Electric batteries may be either primary or secondary. A primary battery is one in which the materials are combined so they may be immediately used in producing an electric current, while in a secondary battery the materials or elements of which it is composed need to be charged by an electric current before it will yield any considerable amount of energy. A primary battery

THE COMPARISON OF THERMOMETERS.

FAHRENHEIT TO CENTIGRADE.

$(t° F. - 32) \times \frac{5}{9} =$ Degrees C.

Fahrenheit.	Centigrade.	Fahrenheit.	Centigrade.	Fahrenheit.	Centigrade.	Fahrenheit.	Centigrade.	Fahrenheit.	Centigrade.
50	10.	61	16.1	72	22.2	83	28.3	94	34.4
51	10.6	62	16.7	73	22.8	84	28.9	95	35.
52	11.1	63	17.2	74	23 3	85	29.4	96	35.6
53	11.7	64	17.8	75	23.9	86	30	97	36.1
54	12.2	65	18.3	76	24 4	87	30.6	98	36 7
55	12.8	66	18.9	77	25.	88	31.1	99	37.2
56	13.3	67	19 4	78	25.6	89	31.7	100	37.8
57	13.9	68	20.	79	26.1	90	32.2		
58	14.4	69	20.6	80	26.7	91	32.8		
59	15.	70	21.1	81	27.2	92	33 3		
60	15.6	71	21.7	82	27 8	93	33.9		

CENTIGRADE TO FAHRENHEIT.

$\frac{9}{5} t° C + 32 =$ Degrees F.

Centigrade.	Fahrenheit.	Centigrade.	Fahrenheit.	Centigrade.	Fahrenheit.	Centigrade.	Fahrenheit.
10	50.	18	64 4	26	78.8	34	93.2
11	51.8	19	66.2	27	80.6	35	95.
12	53.6	20	68.	28	82.4	36	96 8
13	55 4	21	69.8	29	84.2	37	98.6
14	57 2	22	71 6	30	86.	38	100.4
15	59.	23	73.4	31	87.8	39	102.2
16	60.8	24	75.2	32	89.6	40	104.
17	62 6	25	77.	33	91 4		

TABLE NO. 2.

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possesses energy in the materials which will allow a chemical reaction, while a secondary battery is like a reservoir or sponge, capable only of storing energy by means of chemical reaction produced by electrolysis. Electrolysis is the combination of chemical and electrical action. Some batteries may combine both characters in one. These are capable of having the chemical changes take place during the production of a reverse current from some other source; so that, after they have been exhausted by performing their function as a primary battery, they may again be restored to activity by the passage thru them of a current in the opposite direction to the one normally furnished by the cells themselves. This reverse current must be kept flowing for the sufficient time to effect the necessary chemical changes. Such cells are not as efficient in their secondary capacity as storage cells which are designedly such. The energy which they can restore after recharging must always fall far short of the energy expended on them.

Origin of the voltaic cell.—As early as 1767 Sulzer announced to the Berlin Academy of Science the discovery that a peculiar taste is perceived when two different metals are placed together on the tongue and brought into contact at their edges. Such a combination of two metals as copper and silver, and the saline saliva constitutes, as we now know, a voltaic couple. But the significance of Sulzer's observation was not appreciated until more than thirty years later, when Galvani had made his capacity discovery (1786) that freshly prepared frogs' legs, hung by a copper wire on an iron balcony railing, twitched convulsively when the frog touched the iron; and Volta had demonstrated that the effect was not due to animal electricity, but to the two metals; and that electricity, identical with that excited by friction, could be produced by means of the metals without the aid of animal tissues, nerves or muscles. Hence arose Volta's contact theory of electrical excitation, which ascribes what is now called potential exhibited by two metals in their mere contact independently of the medium in which they are immersed.

The word pile, tho not as frequently used as the word battery, is, however, more correct.

The invention of electric piles is due to Volta, professor of Natural Philosophy at Parvia, and dates from the year 1800.

One of the first that he constructed was composed of certain number of disks made of zinc, copper, and cloth piled one upon the other. Fig. 1 shows the appearance of the instrument called the common pile, which has today but an historical interest. It is a pile of

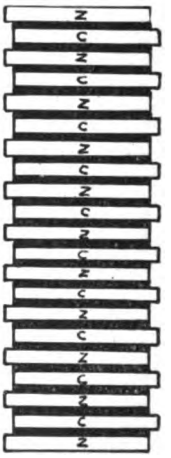

FIG. 1.

disks. While the batteries of today differ somewhat from the batteries of a few years ago, it will be well to use the old demonstration in speaking of zinc. If you immerse a thin plate of commercial zinc into dilute sulphuric acid, a very lively action takes place; the zinc dissolves, and a considerable quantity of hydrogen is given off. It is indeed this process which is generally employed in the preparation of hydrogen gas.

But, if, instead of ordinary zinc, which contains impurities, zinc rendered perfectly pure by distillation be employed, the action takes place very slowly, the bubbles of hydrogen remain attached to the plate of zinc and protect it from further action of the acid.

If a thin plate of platinum or a platinum wire be now placed in the same solution, as soon as the zinc and plati-

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num touch at one point the action becomes extremely energetic; the zinc dissolves and the hydrogen is given off, but from the platinum and no longer from the zinc.

As soon as the contact of the two metals ceases, all action upon the zinc and all giving off of hydrogen are suspended.

This important experiment, due to de La Rive, throws a great deal of light upon all that follows. The results are equally successful when you substitute for the platinum silver, copper or even iron; it gives the same effect when the metals have their point of contact, either in or out of the liquid.

It permits us to explain the difference in the action of sulphuric acid upon pure zinc and impure zinc; the heterogeneous particles of iron or of other metals found at the surface of commercial zinc play the same part as the platinum. You will observe, in effect, that the hydrogen is only given off within very limited points, and at the end of a certain time the surface becomes rough, which shows that the attack has been more active at some points than at others.

Let us resume the fundamental experiment of de La Rive.

Suppose the two metals to have their point of contact not in the liquid but out of it, as Fig. 2 represents. The chemical action takes place in the liquid, as stated above.

It also takes place if, instead of bringing the two plates into direct contact, you put one upon the upper part of the tongue and the other upon the under part. You will experience a slight sensation like that of a feeble electric shock, and also a peculiar taste.

If you place upon the dry part of the zinc a strip of paper dipped in iodide of potassium, and then touch the dampened paper with platinum, a blue spot is immediately produced, which shows that the iodide has been discomposed and set free.

These experiments can also be made if you attach to the zinc and platinum two wires of any length desired, and operate with the two loose ends. If you place one of these in the neighborhood of a freely suspended magnetic needle, you will notice that the needle deviates slightly from its north-south direction as soon as the contact is established between the two loose ends of the wire.

The two metals immersed in the liquid are called electros, and the wires placed at the top are called conductors; everything attached between these two wires is called the circuit. A battery is called open at any point where the conductors are disconnected. All the effects of the current are stopped and the current does not circulate. The circuit is closed when the two parts of the conductor which are separated are brought together.

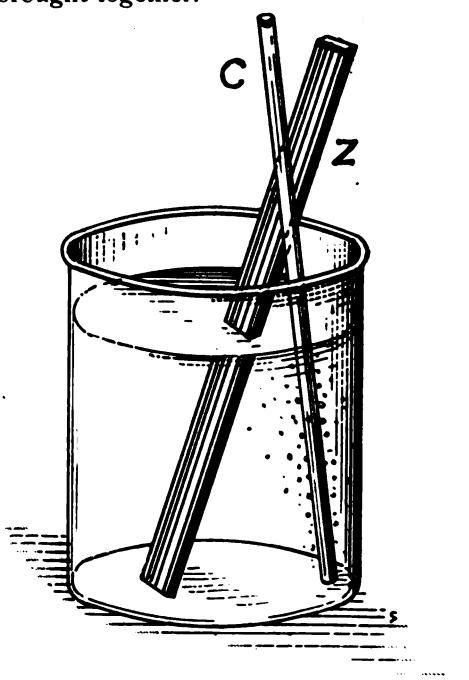

FIG. 2.

It is called a short circuit when the two poles are connected without passing thru much resistance or in close proximity to the battery.

Electric potential in batteries is the measure of the work done or the amount of energy expended or transformed.

Positive current with the plus sign + means work done upon the current, or work done in producing the current, while work done by the current is negative and has the minus sign —. The

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starting point of any current is always positive.

Electromotive force, E. M. F. Electric motive force is the term given to the cause of an electric flow, or it may be called electric pressure or voltage.

Properties of amalgamated zinc. We have shown, in that which precedes, how differently the pure zinc and ordinary zinc act in the voltaic cells.

The result is that when pure zinc is employed there is no local current at its surface, and that the electricity which is produced passes entirely into the circuit between the poles, and also that the hydrogen is given off from the copper.

If, on the other hand, impure or commercial zinc be employed, the giving off of hydrogen takes place, for the most part upon its surface; there is no reason to conclude, from this, that a very large proportion of the chemical action is lost for the production of the electric current.

Thus, in the construction of batteries, the use of pure zinc presents very important advantages; but the price of this material is most fabulous, and it can almost be called a curiosity of the laboratory.

(*To be continued.*)

HOW TO TEMPER TOOLS.

The tools are heated to dull redness, and are then plunged two or three times into a mixture made by dissolving 10 parts of resin in 5 parts of fish oil, and stirring in 2½ parts of melted tallow. The tools are then reheated to dull redness and plunged into cold water.

To temper a hammer, heat your hammer clear thru to crimson or cherry-red heat; then catch the hammer by the eye with strong pick-up tongs. Have ready a pail filled to the brim with clean, cold water. Dip the face of the hammer first half-way up the bulb, then insert the pene the same way. This action hardens the hammer. There ought to be heat enough left in the other part of the hammer to give you the proper temper, a dark blue. If not, place the face on red-hot iron until it reaches the right color. Do the same with the pene if wedge-shaped; if a ball pene, roll same over on hot bar until desired temper is reached; then cool head and pene only. Keep the eye as soft as possible. Hammers and all other such tools are made of about third-grade crucible steel, which is quite as good or better than the finer grades. That grade of steel stands more impacting or hammering than the higher or finer grades.

A POLISH FOR IRON AND STEEL.

A polish that is found excellent for cleaning and keeping clean polished iron and steel is described by the chemical laboratory of the Bavarian trade museum at Nuremberg. It consists of 5 parts of oil of turpentine, 25 parts of stearine oil, 25 parts of rotten-stone and 45 parts of bone charcoal. These ingredients are mixed with sufficient alcohol to produce a fluid mixture, which is applied with a brush to the parts to be cleaned. The alcohol evaporates and the deposited matter is removed with the aid of a dry polish consisting of 45 parts of animal charcoal and 25 parts of rotten-stone. The surfaces thus treated are said to present a bright and polished appearance.

MORE TELEPHONE SURGERY.

Surgery performed by directions given over the telephone is a late innovation. A physician who is connected with the surgical staff of a Philadelphia hospital was called up by 'phone the other day by a nurse at another hospital, with which institution the physician is also connected, and was told that his services were immediately needed for a child who had dislocated its shoulder. "Bring the child right up to the 'phone," said the surgeon. "All right. I have the child in my arms," the nurse replied. "Now then," said the physician, "place the child's elbow against its side, and move its hand and forearm outward." His directions were here interrupted by a sharp click that sounded thru the 'phone as the dislocated member snapped back into its place. "There you are — nicely done, wasn't it?" said the surgeon to the nurse. She replied that the operation had been most successful, and the physician returned to his clinic.

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Telephone Magazine

THE ONLY INDEPENDENT TELEPHONE PAPER IN THE WORLD.

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Published on the 1st day of each month.

ELECTRICAL ENGINEERING PUBLISHING CO.

JOHN C. McMYNN, PRESIDENT.

No corporation, firm or person either directly or indirectly interested in the production or sale of telephones or telephone materials of any sort has any connection, editorial or proprietary, with this publication.

A New Telephone World. Telephone conditions have greatly changed within the year. They were changing before the Berliner decision and they are now changing more rapidly, more extensively. The Independents, their exchanges, their manufacturers, their associations, their publications must keep pace with the procession. There is a bigger, brainier, broader-minded set of men coming into the Independent field, with resources and funds that the pioneers never dreamed of.

What Independent Expansion Means. The general public can not realize the remarkable expansion of the telephone field. Even those in the business see but part of it. Since the Berliner decision the proposed expenditures by new Independent companies and by the Bell interests to meet the competition are enormous.

There are now over 2,000,000 subscribers in this country. 8,000,000 subscribers should be maintained on the existing population at reasonable rates. In five years we should have 10,000,000 telephone users. This means that in the year 1905 the telephone investment in the United States will have passed a billion dollars.

The Message Rate System. London has tried the system of a small annual telephone lease with an additional charge for each call made. The last yearly report of the National Company, which appears in this issue, shows that with the expenditure of half a million of money in giving a message rate service to 16,776 out of 23,490 subscribers, the company could not pay any dividends on the message rate proposition. This ought to be good enough for us to profit by and bad enough to let it alone.

The Bonding of Telephone Companies. The Northwestern Telephone Company, which is operating a telephone exchange in Aurora, Illinois, has filed a trust deed in Kane and Will counties, covering its entire plant, all

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property now owned and to be acquired and all franchises and rights pertaining thereto, to secure an issue of 1,000 bonds of $500 each, bearing 5 per cent interest for a period of twenty years.

The Northwestern Company now stands pledged to pay out $1,000,000 in the next twenty years over and above operating expenses and dividends.

If the money is applied to the construction of the plant it will pay itself out and also pay dividends on the stock. If the promoter gets half of the amount as profit in constructing the exchange, the stockholders will receive nothing but debts.

In some cases we could name the local people have been given an opportunity to invest in the capital stock of the company, the backers, however, retaining a sufficient amount of the capital stock to give them a controlling interest and direction of the affairs of the operating company. On this basis the promoters secure payment for the plant at a handsome profit in cash, which more than represents its value, and the people who are induced to invest in the stock of the company hold certificates which do not represent any tangible property until the bonds have been redeemed. As the bonds are usually held by interests friendly to the promoters the local stockholder has but little more than an evidence of his hopes.

The question of funds for the expansion to meet the demands for telephone service has become an important factor, the requirements being greater than could possibly have been anticipated. In the Bell subcompanies the parent company takes 51 per cent of the stock. To relieve the parent company the "debt clause" in the perpetual contracts has to some extent been eliminated and many of the subsidiary companies have financed themselves. One plan has been by underlying bonds. While this might be considered as weakening the value of the stock held by the Bell Company the money has been so well invested that no special depreciation of Bell assets is apparent. Altho the dividends of subsidiary companies have been materially reduced, still their earnings warrant a fair dividend on the money invested.

The bonds of the following companies have reached the Boston market and have been absorbed principally in Massachusetts:

New England Telephone & Telegraph Company, East Tennessee Telephone, Sunset Telephone & Telegraph, Duluth Telephone, Cumberland Telephone, Michigan Telephone, New York & Pennsylvania Telephone, Pennsylvania Telephone, Central Union Telephone Company, Chesapeake & Potomac Telephone, Southern New England Telephone, New York Telephone Company of Canada, Empire State Telephone, Missouri & Kansas Telephone, Iowa Telephone.

Total outstanding bonds of the American Bell Telephone and American Telephone & Telegraph Company are $15,000,000 in addition to the bonds of the subsidiary companies above named.

The American Telephone & Telegraph Company completed the issue of $5,000,000 treasury stock January 15 last. The recent sale of 527 shares at auction by order of the directors brought 161½. The company will require $5,000,000 more of money, which it will receive thru the issue to bankers of five million of bonds, being the last of the ten million bond issue authorized. The bonds then outstanding will be $20,000,000 of the parent Bell. All of which means that a good telephone property can be bonded for its cost and pay dividends on stock. But the bonded

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indebtedness of telephone exchanges, which represents a large profit on construction, will swamp the ordinary exchange, and render the stock of doubtful value. Investors seeking Independent telephone investments should be assured that their holdings are in the exchange and not in the pocket of the promoter.

REMARKABLE EXPANSION OF INDEPENDENT INVESTMENT.

Local investors of Independent telephone properties in Ohio, Pennsylvania, and western New York, are frequently uncertain as to the values and standing of the local exchanges in which they may be interested. The combination of exchanges, toll lines (long distance) and farmers' lines occur so frequently as to bewilder the ordinary investor. The prime mover is the Federal Telephone Company, which is the parent company of all the Anti-Bell exchanges in this district. Its authorized capital is $10,000,000, all of which has now been issued. It has no plant and no operating expenses. It holds a majority of the capital stock of its various constituents, including the Cuyahoga, Columbus Citizens', United States (long distance), Columbiana County, Portsmouth, Akron, Massillon, Fostoria, Youngstown, Galion, Shelby, and Lancaster companies. Companies to operate in Zanesville, Bowling Green, and Stark county are organized, but not yet financed. The Federal Company also holds interests with Detroit people in the Independent Telephone Company of that city.

The companies are capitalized as follows:

Cuyahoga	$3,000,000
Columbus Citizens'	500,000
Columbiana County	300,000
Youngstown	200,000
Akron	200,000
Galion, Shelby, Lancaster	110,000
Massillon	75,000
Portsmouth	60,000

When the three new companies in Stark county, Bowling Green and Zanesville are financed the capitalization of the companies subsidiary to the Federal will be within a few thousand of $5,000,000, exclusive of the long distance company, whose stock, aside from the amount necessary to give a share to each director, may be held in the treasury of the company indefinitely.

The Federal Company's income is confined to the dividends and interest of bonds which may be paid to it by its constituent companies. Of these the Columbus Citizens' Company is said by a well-informed authority to be earning seven per cent upon its stock. The Cuyahoga Company has installed a sufficient number of telephones to pay all expenses and fixed charges, and has a steady run of orders for additional service. The Detroit company is on a paying basis, and the various smaller exchanges are more than self-sustaining.

None of the stock of the United States (long distance) Company, amounting to $2,000,000, has yet been issued. This company's lines will be in Pittsburg within a month. It now connects with exchanges extending to the Ohio river. It also extends west to Bay City, Mich., and by eastern exchange connections to Ashtabula and Erie.

The expansion of the Independent system now in progress is likely to be extended as fast as local exchanges can be established.

MERRITT 'PHONE BILL PASSED.

The Washington State Legislature at Spokane passed the Merritt bill making uniform rates for telephone companies. The charges in the bill are: For business telephones, $4 a month; two-party lines, $2.50; more than two parties on a line, $1.50; for long-distance conversation up to fifty miles, three minutes, 25 cents; fifty to one hundred miles, 50 cents; more than one hundred miles, excess to be paid for at the rate of one-half cent per mile.

There was a sharp debate over the bill, a number of members insisting that the bill was unfair and that it had no justification.

It may be contested.

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KEEN COMPETITION FOR INDEPENDENT FRANCHISE IN BUFFALO.

Three companies, the Queen City Telephone Company, the Buffalo Telephone Company, and the Independent-Union Telephone Company were heard in behalf of their respective applications for franchises or permits to do business in the city of Buffalo, N. Y. Their petitions are practically as follows:

"Your petitioner is willing to accept a franchise from the city of Buffalo for the purposes aforesaid, subject to such reasonable conditions and stipulations as may be hereafter agreed upon, and your petitioner is willing to contract with the city of Buffalo and agree permanently to conduct and carry on its business as a competitor of all existing telephone companies, their successors or assigns, to the end that the public may at all times in the future have the benefit and advantage of competitive rates in telephonic business. Your petitioner is further willing to contract and agree with the city of Buffalo upon a maximum price for which it will supply and furnish unlimited telephonic service to the citizens of Buffalo."

Judge Thomas, President of the Independent Telephone Association of the United States, speaking in behalf of the Queen City Telephone Company, made an interesting speech which we give in part:

There is no more rapid communication known in the world today than the telephone itself, and it is possible now to talk over something like 1,500 miles of wire and get a good, clear conversation if your line and instruments are in good working order. The American Bell Telephone Company became the owner of the patents. The subsidiary Bell companies were organized, which companies controlled certain defined territory thruout the United States. I mean by subsidiary companies such companies as the Bell Telephone Company of Buffalo, which controlled certain territory and paid the American Bell Telephone Company royalty for the use of these instruments protected under these patents. A few years ago when the basic patents were about to expire, had expired, as we claim, we conceived the notion of going into the telephone business on our own hook, claiming the right, in view of the fact that the protection that was given to the American Bell Telephone Company, the owner of these patents, having expired, it was open to the public and we desired to go into the business; not as a mere matter of sentiment, because we knew or thought that some money had been made in the business, and we were anxious, in the first place, to get into the business ourselves, and, in the second place, to meet what we thought was a demand for greater telephone service than had ever been given to the people. Up to six years ago there were in existence in the United States about 682,000 telephones. Last year, previous to June, there were in existence in the United States, after six years of opposition which had grown, of course, from a mere child up—more than 2,500,000 telephones in the United States. In other words, the growth had been nearly 2,000,000 telephones in six years of opposition; whereas, in nearly twenty years of protection, there had been placed in the business houses and homes of the people of this country less than 600,000 telephones.

They said to us, "You have no right to go into the telephone business. We have all the rights and we will go into the courts and close you up." We did not believe they were right. We have tried more than sixty cases, suits brought by the American Bell Telephone Company and her sub-companies, in the last six years, and defeated them in every case except the suit brought by the United States Government to cancel the Berliner patent. The courts said in that case: "The courts have no right to cancel the grant of the Government itself in a suit brought by the Government against the company or an individual unless you can show fraud or collusion." So, after that decision — or before that decision, rather — a suit was brought against one of the so-called infringing Independent telephone companies in Boston, Mass., argued last November, a year ago, and about two weeks ago, decided, in which the court upheld every defense that had been

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made by the Independent telephone companies against that so-called patent or invention of Berliner's. So, while we have had to fight it out on these lines, we have done so and won every contention since that decision that has been brought before the courts of the United States.

You ask why it is that more telephones were not placed into use prior to six years ago. That is answered just exactly in the same way that you would answer the question relating to any other monopoly. A monopoly seeks, at the least outlay of money, to get the greatest revenue. They did not care in Buffalo to put telephones in your homes unless you were willing to pay them the price that they charged. They did not care to put them in your business houses unless you would meet all of their arbitrary demands. And right here I desire to offer an apology for the Bell Telephone Company of Buffalo, because I presume that it is managed by men who, if they had their own way about matters, possibly would do a little bit differently from what they do today. But the stock of the Bell Telephone Company of Buffalo — the controlling interest in it — is owned and controlled in Boston, Mass. Therefore, those who are here in charge of the affairs of this company have no power to carry out what they would desire to do in respect to the enlarging of telephone service in the city of Buffalo. The company allowed itself to be tied up several years ago under contracts that prevent them from meeting the desires of the people in this work today. They agreed, in consideration of the grant of this territory here to do telephone business in, that they would continue to pay to the American Bell Telephone Company royalties on these instruments long after the expiration of the patents and the protection that the United States had given to these inventors. They not only agreed to do that, but to place under the control of the American Bell Telephone Company a controlling interest in the stock of this company. Therefore, their hands are tied and they are unable to give, until opposition actually enters the fields and comes into competition with them, and a grant is given them by the American Bell Telephone Company or the company that has taken over the American Bell — unable to give you such prices as will enable you to get telephones generally over the city of Buffalo. Therefore, we say that what the city of Buffalo needs — what it wants — is an opposition telephone company.

We conceived the notion, and we have carried it out in between three and four thousand towns and cities in the United States already, that a reduction in price, say, of fifty per cent of the amount charged by the Bell Company would place in that city or town three times as many 'phones as were theretofore operated in the town. It is the same thing that you find in other enterprises, other businesses; when competiton enters the field the prices are reduced. You will find that the demand for the supply of that commodity increases three, four and five fold from what it was before, and sometimes to a greater extent. In other words, when competition enters the field in a business like the telephone business, you take what was considered a luxury and make a necessity of it. You might as well talk today about doing without your heating apparatus in your storeroom and in your office downtown as to do without the telephone. Why? Because it has become a necessity; it is a necessary part of the appliances necessary to carry on your business.

In your twin city over here, Cleveland, less than three years ago there were about 4,500 telephones. As near as I can estimate the number of telephones on main lines in the city of Buffalo I think today you have less than 4,000; if more, very little more. You have in extension 'phones more than that number, but I am speaking now of main-line 'phones. Today in the city of Cleveland, under one year's competition, if the claim of the Bell Telephone Company is right, we have more than 20,000 telephones in operation. A good opposition company in the city of Buffalo will place telephone matters in such a state here and make these two companies so active that in two years from

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this time you will have 20,000 telephones in the city of Buffalo. This business has progressed to such an extent, as I said before, that there are between 3,000 and 4,000 Independent telephone exchanges in operation in the towns and cities of the United States today.

Now, what we want to do, in view of the fact that New York, Boston and Philadelphia are already proceeding to build Independent telephone companies, in view of the fact that Syracuse and Rochester have very flourishing exchanges, and very many of your smaller cities in New York have them, we want to get this thing so worked out that we can get it thru, along the New York Central Railroad here and get our line into New York, Boston and Philadelphia. We do not want to be compelled, gentlemen, to go around Buffalo in building that line thru to the East, because we are going thru to the East, and it is to the interest of the citizens of Buffalo to have it stop off here with its terminal connections. We can not get those terminal connections of your Buffalo Bell Telephone system here, because they are prohibited under their contracts with the American Bell from giving us entrance into the city. Therefore, we must rely upon an opposition company to take us into Buffalo and carry us out and give us communication with your stores and homes. This is the principal reason that I come to Buffalo to address you today, gentlemen of the committee, because I wanted to bring to your minds what is going on in this line all over the United States.

NEW INDEPENDENT COMPANY AT BUFFALO, N. Y.

The Queen City Telephone Company of Buffalo has filed a duplicate certificate of incorporation with the county clerk. The plans of the new concern were so quietly made that the only indication that something was doing was a rumor of a possible rival to the Bell Company.

The certificate indicates that the company intends to give a thorough local service and also to extend its lines to Rochester, Syracuse, Albany, Poughkeepsie and New York; to Tonawanda, Niagara Falls, Lockport, Oswego, Watertown and Ogdensburg; to Dunkirk, Erie, Cleveland, Detroit, Toledo and Chicago, and to Jamestown, Hornellsville, Binghamton, Corning, Elmira, Scranton, Wilkes-Barre, Philadelphia, Jersey City and Washington.

The capital stock of $500,000 is divided into 5,000 shares. The directors for the first year and their holdings are: Hardin H. Littell, eight shares; Robert R. Hefford, Frank H. Goodyear, Chas. W. Goodyear, Robert F. Schelling, Eugene A. Georger and Samuel E. Wayland, each seven shares. All the directors are Buffalonians, except Mr. Wayland, who is of Scranton, Pa.

The purpose of the company, as stated in its certificate, is "to construct, own, use and maintain a line or lines of electric telephone wholly within or partly beyond the limits of this State." Director Hefford had this to say of the new enterprise:

"The company is about to apply to the common council of the city of Buffalo for the proper franchise sufficient to allow it to do business in this city.

"The men who have undertaken this enterprise have in view primarily the installation of a telephone system in Buffalo, which will give to the citizens a first-class telephone service at reasonable prices. That can be done, and at the same time a fair profit be reaped upon the investment, for those who are subscribers to the stock of the company. Similar companies have been organized in Scranton, Pa., Syracuse, Rochester and other cities. They have prospered and have been able to give their patrons the best possible telephone service at very reasonable rates. The idea is to make the rates so low that telephones can readily be available for the greater part of our citizens, and the profits to the company to result from the large number of telephones used, rather than from the large prices charged for the same.

"The character and business standing of the men who have undertaken the formation of this company are sufficient to insure success.

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TALKS AND CROSS-TALKS.

BY A. E. DOBBS.

HINTS TO CORRESPONDENTS.

Write on one side of the paper only, and make sketch or diagram, when necessary. Endeavor to give all the facts bearing on the case, so as to enable the editor to answer intelligently.

Name and address must accompany each letter, not for publication, but for the information of the publisher.

A NEW WAY OF REDUCING FREQUENCY.

Inexperienced young managers sometimes do some funny things, and one of the latest stories in that line comes from the Pittsburg district.

A young man sent to take charge of an exchange of seven hundred subscribers, after looking things over, came to the conclusion that the office generator was running too slow, "for," he argued, "by running it faster we can get a higher voltage and therefore get the full output of the generator."

Well, he speeded it up till he got a frequency of about forty to the second; and the bells, not being adjusted to such a high rate, practically stood still between the magnets and refused to ring. The next morning the company had about five hundred cases of bell trouble on the slips and every trouble-hunter in the office was sent out to put the bells in order, to the neglect of other work.

But still the ringing service was not satisfactory, and after some hard thinking on the part of the manager he made up his mind that the frequency was too high, but how to remedy it he did not know, till he read somewhere in a book that the "voltage is increased in proportion to the number of times the armature conductors cut the field of force." Here was an idea! His frequency was too high! If now he could "reduce the number of lines of force cut by the armature he would reduce his voltage, and therefore get only half the frequency."

To obtain this result he removed half the magnet bars from his generator.

AN ANSWER TO NO. 79.

95. In reply to query No. 79 in the March issue I would say that there need be no difficulty in finding the proper polarity of the receiver.

Connect as if for local battery, then unscrew the cap of the receiver. If properly connected the diaphragm will be held tightly against the poles of the receiver; if not, the diaphragm will be held lightly or not at all. This is a sure test for the proper polarity of the hand 'phones.

Another way is to call central. If the transmission is good, the receiver is properly connected; if distant, muffled and weak, it needs to be reversed. If wrongly connected the remedy is to reverse the cord connection on the receiver. C. T. DODDS, Chicago, Ill.

Meanwhile no answers have as yet been received to query No. 84.

A JOB OF REBUILDING.

96. Mr. Warren E. Fastnacht sends us sketch No. 1 and wishes to know the best method of rebuilding it to make a bridging line of it. The wire used is No. 12 steel, and,

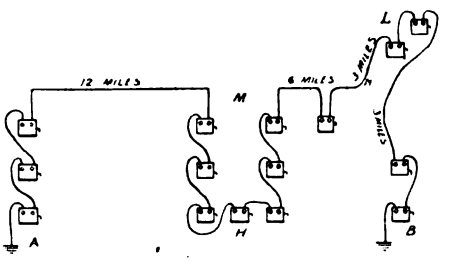

FIG. 1.

as will be seen from the drawing, the whole line at present has about twenty-seven miles in it, or twenty-one miles bridged, while there are fifteen instruments in circuit at the present time. Also that the parties owning the line will not pay for copper wire, so that the only thing to be done is to fix up the wire they have.

Well, the Inspector is not on the ground and does not know just what he would do if he was there, but he would suggest Fig. 2 as the best solution to be had under the circumstances. As there will probably be some trouble in ringing, it would be advisable to use 1,600-ohm bells, carefully adjusted, with a heavy magneto-generator in the instruments, and before ordering the instruments send this sketch to the man-

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ufacturer and require his guarantee that the bells and generators will do the work, provided that the line and ground contacts are all right. Also specify 250-ohm induction coils.

In overhauling the line examine all connections, for those farmers are sometimes very careless in the matter of making joints, and if not well made solder them.

It would be a good plan to cut out the village H from the main line, as the villagers will do a great deal of talking among themselves, and at some one house at the village put in a switching station, which may be a simple open jack, across which a drop or extension bell is bridged to ground, to be left permanently in circuit. This will relieve the line of six instruments for thru work.

old loops and connect them together at the instruments, as in that way you increase the length of the line without any corresponding advantage. It will be observed, however, that at the points marked s, s, s, s, s, are placed single-pole small knife switches similar to the method shown in Fig. 1 of the March issue. This is done for testing purposes only, and the three switches should be placed in a small box underneath the cross-arm.

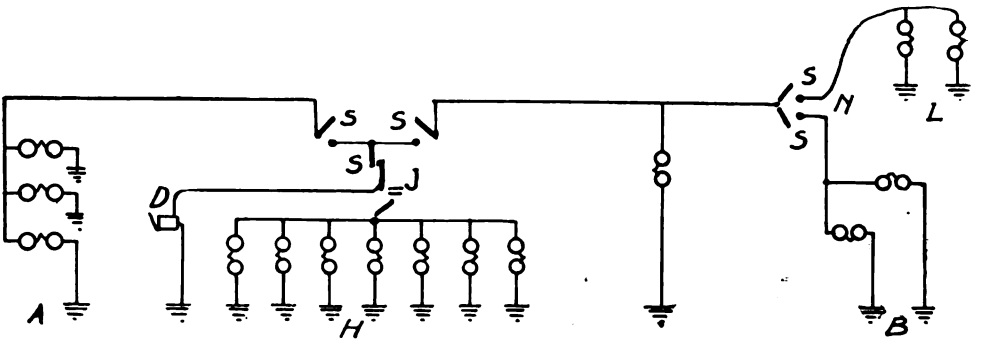

FIG. 2.

The switches should be mounted on porcelain and the box should be painted inside and out to exclude moisture.

Or, if preferred, the two ends can follow the old loop to the switching station at the village H, and brought into a plug switch like that shown in Fig. 3, which explains itself, as enabling the operator to plug in either east or west,

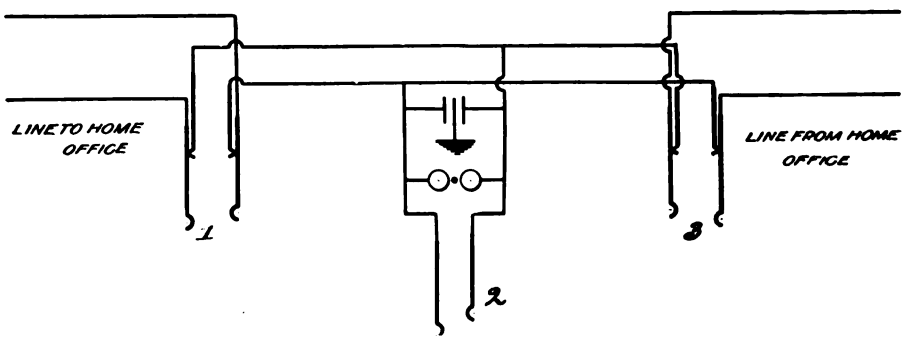

FIG. 3.

If this is not desirable the village might be left on the short end of the line (Stations L and B) permanently, while the station A is connected to the line by means of a plug switch.

It is not a good plan to follow the or separate the line into two sections, thus enabling the two ends to be used at once. As to the proper connection of lightning arresters, the company you mention makes several different kinds, and it would be a good idea to write to

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them direct. I do not think that a zinc plate would be very satisfactory as a ground plate, for the reason that in contact with copper wire there might be an electrolytic action between the copper wire and zinc plate that would make trouble sooner or later. Take a copper plate a foot square, turn one edge over to clasp the wire, as shown in Fig. 4, and fill the space with solder to insure good contact.

As to burying old iron, tin pans, or coke, with a ground plate, they are of

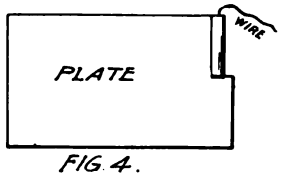

FIG. 4.

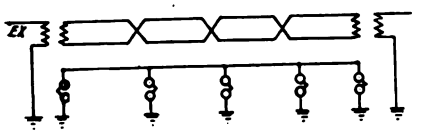

FIG. 5.

little, if any, practical advantage in damp earth. A thin layer of coal coke is sometimes an advantage in protecting the copper plate against corrosion from too direct contact with the earth.

---

97. We have a grounded toll line fifty miles in length, alongside of which for six miles is also a grounded farmers' line with ten instruments on it.

The two lines are 6 feet apart, but when one line is in use it is impossible to use the other on account of the noise and cross-talk on the line. Is there any way to remedy this without making both lines metallic?

J. E. S.

You can make the farmers' line metallic, or make the toll line metallic as far as it is paralleled by the farmers' line. As we gather from your letter that the farmers' line does not start from the home exchange, but somewhere near the middle of the line, it will be necessary to place repeating coils at the ends of the circuit if the toll line is made metallic, as shown in Fig. 5, while if the farmers' line is made metallic they will be unnecessary.

Transpose in this case every quarter of a mile.

SOMETHING WRONG WITH EXCHANGE WIRING.

98. We are troubled a great deal with cross-talk. Our system is a grounded one, and as we can not afford metallic circuits, we contemplate putting in a common-return wire. Would that do away with the cross-talk?

R. H. H.

If you have cross-talk on a grounded system you will have still more in a common-return system. The trouble is in your wiring or arrangement of circuits. You may have damp cotton-covered wires in your switchboard cables, or you may have a punctured paper cable. You may have several wires on one ground rod. If you have a grounded or single-wire board, the trouble may be inherent in the board itself. If your wires are several miles in length and parallel each other for that distance, nothing will cure your trouble but metallic circuits, while a return wire will only add to the trouble.

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99. Can not a generator be wired so as to deliver either a direct or alternating current to the line?

G. M. R.

Yes, split the windings as in Fig. 7. Put in an extra ringing key to the board

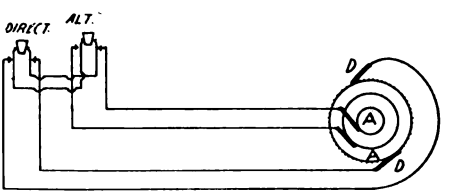

FIG 6.

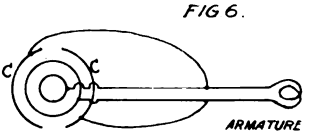

FIG 7

as in Fig. 6, from which it will be seen that throwing one key gives alternating current while the direct is open, and vice versa.

---

100. In a system where a grounded common-return wire is used is it any advantage to ground the lead sheath of the cable?

G. M. R.

Yes, in most construction work the lead sheath of the cable is grounded anyhow, thru connection with the messenger and anchor guys.

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A NEW FARMERS'-LINE PLAN.

Here is an idea that, to the Inspector's knowledge, has never been worked out before, and one that is worth knowing, as combining what is really a duplicate line, where every one does his own switching. Of course it is possible to signal central by means of a direct-current generator at the subscriber's instrument, but that, however, cuts subscribers off from signaling each other, which in the present case does not seem to be desirable. But here is the letter which indicates a state of things:

I enclose a plan for the improvement of a majority of farmers' mutual lines that have come under my notice, which, if you consider it worth while, you are at liberty to publish.

In this State most of the farm lines are owned and controlled by the subscribers on each line, a single wire is strung from one village exchange to another, a distance of from seven to twenty miles, as occasion demands, and anywhere from a dozen to thirty instruments bridged from this wire to ground. The result is that operators at the exchanges are annoyed and perplexed by reason of receiving all the code signals between parties calling each other on this wire. If one of them wishes to call up either central he is hindered and often prevented from doing so by reason of so much visiting on the wire, and further, by reason of so many receivers being taken down to eavesdrop to the thru message, so that if the operator does not receive the first call she never receives the second or subsequent calls.

The enclosed diagram (Fig. 8) represents two central exchanges A and B, connected by

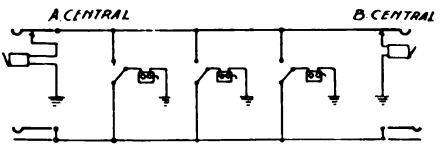

FIG. 8.

two wires, one terminating in a bell or drop signal and spring jack, and the other terminating in an open jack with no signaling device.

The intervening stations are each equipped with a two-point switch, normally resting on the lower wire. Thus each farmer, or subscriber, can call his neighbor without disturbing the exchange. In case he wishes to call an exchange at either end, he merely turns his switch to the upper contact, makes his call and his neighbors are not aware of the act. The exchange, however, in calling people on this line would call thru the lower wire, unless a subscriber should forget to turn his switch back, when the call could be made thru the upper jack.

In this State (New York) the majority of farmers have telephones connected to lines owned by themselves, and pay the nearest exchange an annual stipulated fee for doing their switching to other lines. The farm lines are so heavily laden that ordinary drops will not work and extension bells to the number of fifteen in some exchanges are used. (There are thirteen in our own) which, in a busy time makes a perfect bedlam of noise. The above idea is not only to get rid of this noise, but, in a measure, preserve secrecy and improve the service in general, the only expense being that of an additional wire.

Yours truly,

C. E. SCOTT,
Deposit, New York.

WIRELESS TELEPHONY.

101. I have a place here where I want to use a wireless telephone system. It is from the mainland to an island thirty miles off the coast and 80 feet above the lake level. Is the plan feasible. F. S. V.

The Inspector has never experimented with wireless telegraphy or telephony and is not, therefore, in a position to give very intelligent advice on the subject, but would say that the eminent head of the British postoffice telephone system made some experiments along that line (TELEPHONE MAGAZINE, October, 1900, page 143), and did not succeed in getting a working distance of more than about four miles.

There is also a book published by the *Electrical World and Engineer*, of New York, called a "History of Wireless Telegraphy," by J. J. Fahie, price $2, that will probably tell you all that we know so far on the subject.

We don't wish to discourage you, but if you succeed in making wireless telephony work at a distance of thirty miles you will make a reputation for yourself, and possibly a well-merited financial reward.

---

102. We have had a very good operator's receiver demagnetized. Could it be that it was demagnetized by a generator current?
G. K. S.

I hardly think so. It was more likely that the operator went in on some line that was crossed with a trolley or electric light current, or it might even be caused by lightning.

---

103. I have several toll lines coming into my exchange which, when cut straight thru, will almost carry on a conversation in a whis-

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per, but if the operator cuts in, subscribers have to shout in order to make themselves heard. Now when another station listens in there is a difference, but not so much as that, and I would like to know why this is so?

C. M. DEG.

The trouble indicates that the operator's transmitter and induction coil is of very low resistance, while that of the stations is probably 250 ohms, more or less. Possibly the induction coil on the board has become reversed — that is, the primary on the line side and the secondary on the battery side. If that is the case, talking on the part of the operator should be difficult, while her hearing should be good, or, in other words, she would hear other people better than they would hear her, but of course this would apply to the town lines as well as the toll lines.

Operators' coils are sometimes wound to a resistance of 20 ohms or less.

---

104. We have trouble from electric light induction that we can not trace, as we have looked the town over carefully and can find no possible crosses anywhere. We have even gone into the houses looking for possible crosses in the house wiring, but can find none.

Our system is common return and all country and toll lines full metallic. We do not parallel the electric light lines nearer than 15 feet, and cross them at right angles no nearer than 15 inches.

ROSSVILLE TELEPHONE COMPANY.

If the electric-light people run arc circuits it is possible that they run single legs up one street and down another, as in Fig. 9, in which case you would get

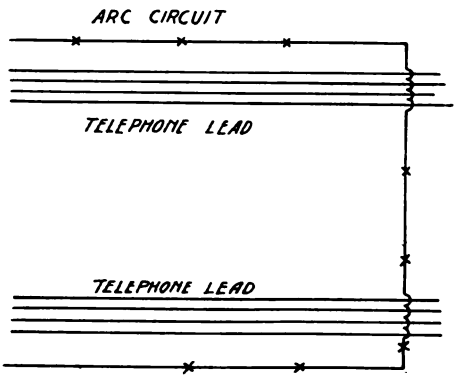

FIG. 9.

induction and plenty of it from the arc-light wire. The remedy for this is to make arrangements with the electric-light people to run their return legs on the same cross-arms as the outgoing legs, which they can do by splitting their loops. It may be that their system and your common return is grounded on the same water mains.

---

105. We have a common-return system which gives a very good talking service to our town subscribers and our country lines, but when connected to our metallic toll line it becomes very noisy.

We would suggest the use of a repeating coil between your lines and the toll lines on your switchboard.

We have a question as to the use of a Wheatstone bridge set that will appear next month.

BRAZING BRASS TO COPPER.

The best solder for uniting brass to copper is soft brass, which will melt much easier than the brass which is to be joined to the copper, otherwise the work would melt at the same time as the solder.

The edge of the work must be carefully cleaned, and then the parts brought together in their proper place and secured with iron wire. The flux to be used is borax, rubbed up in water until it is like a fine cream. The solder, which may be in the form of beads or strips of wire, is next distributed along the joint. The amount of heat and the method of applying it depend entirely upon the size of the work to be done. If the work is small the blow-pipe is by far the most convenient and safest, because if the heat is too great there is danger that the brass part of the work will be melted. The heat is to be applied until the solder melts. As soon as the solder melts or "flushes," the work should be struck so as to jar it just enough to make the solder flow into the joint. To find out whether the solder is soft enough for the work, a piece may be laid upon a bit of brass of the same kind as that of which the work is made and put into the fire. If the solder melts considerably sooner than the brass it will be safe to use it for the work. If, on the other hand, they both melt at the same time, a softer solder will be needed. Spelter solder may also be used for the purpose.

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NOVEL USE OF THE LONG-DISTANCE WIRE.

Jessie Bartlett Davis was just bringing to a close a most successful week at Shears' Theater in Buffalo. She had signed for another week, and had agreed to give two new songs. Sol Bloom, the Chicago music publisher, selected "Beyond the Gates" and "Just Because I Love You So" for her and mailed the manuscript to Buffalo.

Thru some error the songs failed to reach their destination. Mrs. Davis was advertised to give the new songs Monday night, and when they had not reached her on the Saturday previous she was almost prostrated at the prospect of being compelled to disappoint her audience.

JESSIE BARTLETT DAVIS.

Saturday afternoon came, but no new songs. She called up Mr. Bloom with a long-distance 'phone in her room at the Iroquois Hotel. Like an inspiration it occurred to Mr. Bloom that the songs might be memorized with the singer five hundred miles away, with the receiver of the 'phone to her ear, as well as if she were standing beside the piano with the score before her.

He hummed a few bars of the first song, "Beyond the Gates," and Mrs. Davis immediately voiced her approval.

"I like that," she said. "Have a piano moved into the room and let me hear the arrangement."

The piano was moved close to the 'phone and soon Mr. Bloom was playing the song for the benefit of his distant listener. The song was repeated time after time, and then Mr. Bloom listened while the singer repeated it on the piano in her room.

This was done with both the songs until Mrs. Davis had memorized them as completely and perfectly as if the long-delayed manuscript had arrived. The orchestration was written in Buffalo, and Mrs. Davis sang the songs before thousands who knew nothing of the novel way in which they had been sent to her from Chicago.

When the receivers were at last hung up two and a half hours had been consumed in the novel task. A bill of $125 for the use of the wire had been run up, but the singer was happy in the possession of two new songs, and thousands of theater-goers who had been promised a new repertoire were not disappointed.

Necessity, the mother of so many inventions, was responsible for the happy utilization of one of the century's greatest conveniences.

SUSPENDED IN MID-AIR.

George Butter, an employe of the Rock County Telephone Company, was at work on the cable along the south side of the park this afternoon. He had a trolley with a swinging seat attached that he slid along the cable until he arrived at the place where he wished to make the repairs. He went along all right until about midway between the poles and here his trolley wheel jumped the wires to which the cable is strung and caught on the cable, leaving him suspended in midair, unable to go backward or forward. He remained in this position for a long time, until George C. Sutherland came along and telephoned to headquarters for help. A rope was brought up by Superintendent Adams, thrown over the wire and cable, giving Butter a chance to raise his weight from the trolley seat and get the wheel back onto the wire. With the help of the rope he succeeded in getting back to where he started. The next time Butter undertakes a job of this kind he will carry a parachute.

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THE NEW SOUTH SIDE EXCHANGE OF THE PITTSBURG AND ALLEGHENY TELEPHONE COMPANY.

The South Side exchange of the Pittsburg & Allegheny Telephone Company is a branch of one of the largest and most complete telephone systems in the United States. The main exchange is located in a large stone building at the corner of Seventh avenue and Fountain street, in Pittsburg, and has a present equipment for 4,080 lines, with an ultimate capacity of 5,400 lines. With it are connected, by means of trunking circuits, six branch exchanges, which make the present equipment of the system over 7,000 lines and its capacity over 16,000 lines. It operates thruout on the central battery plan.

The switchboard of the South Side exchange, a view of which is shown in Fig. 1, consists of two sections of four-panel multiple switchboard, known as the "Universal" type, having two operator's positions per section and a present equipment for 240 subscribers' lines. The line signals consist of mechanical rotary disks which are self-restoring by gravity. The first operator's position is for incoming trunk lines, being equipped with twenty incoming trunk jacks and with multiple jacks. The second position has line signals and answering jacks for 140 lines, and twenty jacks for outgoing

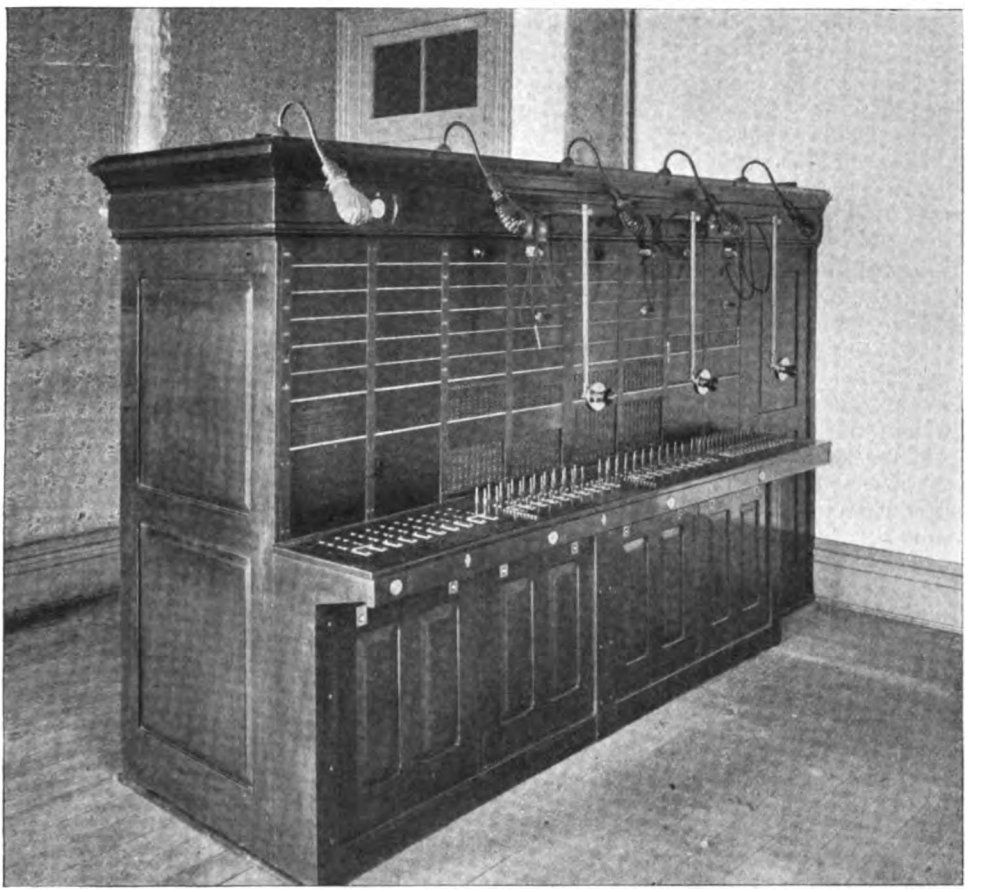

FIG. 1.—TWO SECTIONS UNIVERSAL TYPE MULTIPLE SWITCHBOARD.

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trunk work. The third position has line signals and answering jacks for 100 lines and jacks for outgoing lines. Both of these positions also have multiple jacks. The fourth position is left vacant to provide for future increase. Each of the two central positions are provided with ten order-wire keys by which the operator can connect her talking circuit with that of an operator at each of the branch exchanges and notify her what trunk line to use in making connections. Each position is also equipped with ten pairs of cords and plugs, with combination ringing and listening keys. With each of the plugs is associated a small incandescent supervisory lamp by which the operator is kept informed at all times of the condition of any pair of connected lines of the board.

The operation of making a connection is as follows:

The subscriber signals the operator by merely taking his receiver from the hook. This serves to automatically operate one of the rotary signals in front of the operator and thus attracts her attention. The answering plug is then inserted into the answering jack in the usual manner. After learning the number of the subscriber called, she inserts the corresponding plug into the corresponding multiple jack, and operates his ringer by means of the ringing key. As soon as the calling plug is inserted into the jack of the called-for subscriber, the supervisory lamp associated with it immediately lights up, and remains lighted until the subscriber takes his receiver from the hook. The operator thus knows that he has responded. During a conversation the two supervisory lamps are out, but as soon as either receiver is placed on the hook, the corresponding lamp is lighted. When both lamps are lighted the operator knows that the line is no longer in use and immediately pulls down the connections. This avoids the necessity for the operator at any time to listen-in and consequently enables her to control more than double as many lines as was previously possible. As this double supervisory system is obtained by only two strands in the cord and two contacts in the jack, the switchboard wiring is also greatly simplified.

The rear of the switchboard with panels removed is shown in Fig. 2. The framework is of structural iron firmly riveted together. On the back of the legs of each section is placed a connecting rack to which all the wiring from the answering jacks, signals, etc., of the section is led. The line wires are brought from the distributing frame in 21-pair cables and are connected with the local wiring at the connecting rack by brass connecting clips, to which they are soldered. Above this are seen the fuse-blocks and the supervisory relays, which are encased in soft iron shells. Above these is shown the wiring for the line signals and answering jacks and at the top is the shelf for the multiple cabling. Along the roof is carried the wiring for the light and power circuits, supported upon porcelain cleats.

Fig. 3 shows the power plant and distributing frame. The line wires enter the building in lead-sheathed cables and terminate in Cook cable heads, provided with lightning arresters. They are then carried in 21-pair cables to the line side of the distributing frame. From the switchboard side of the frame they are led in 21-pair cables to the connecting rack, as already described.

The power plant consists of one two-horse power Wagner alternating current motor, running from 104-volt circuit, and two ¾-horse-power Roth generators, belted to the motor, and giving current at suitable voltage for charging storage cells. The machines are mounted on a power table having mahogany paneled sides, which contain the rheostats and starting boxes. All wiring is concealed within.

The power switchboard is of slate mounted in an iron framework. It contains two I. T. E. under and over load circuit-breakers, two 90-ampere, single-throw, double-pole switches, five 90-ampere double-throw, double-pole switches, one Jewel ammeter reading to 75 amperes, and having six shunts, and one Jewel voltmeter reading to one hundred and fifty volts. All heavy fuses, ammeter and voltmeter switches are also mounted in the switchboard.

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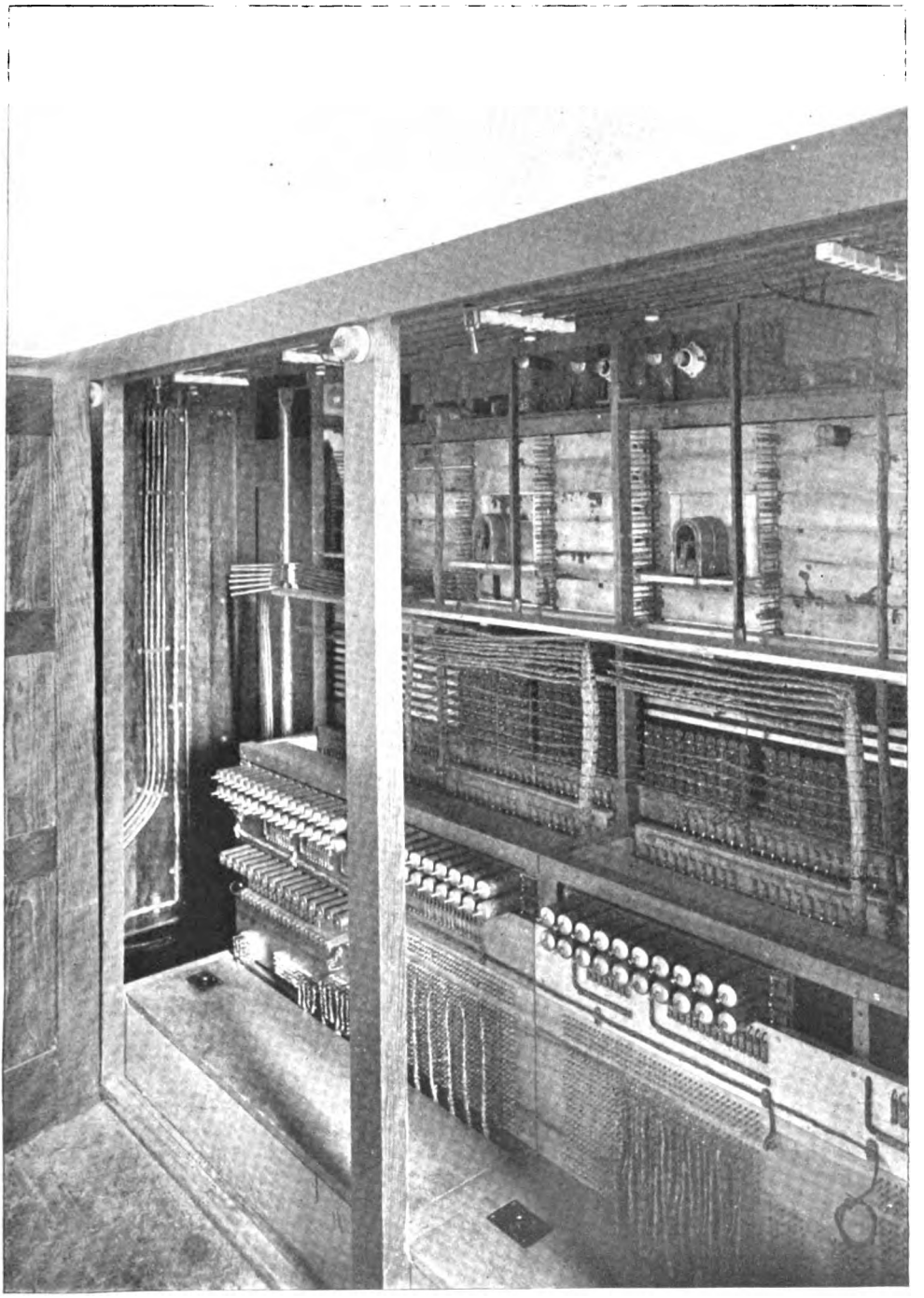

FIG. 2.— REAR OF THE UNIVERSAL TYPE MULTIPLE SWITCHBOARD OF THE NEW SOUTH SIDE EXCHANGE OF THE PITTSBURG AND ALLEGHENY TELEPHONE COMPANY.

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The fuses of the leads to the repeating coils are mounted on a slate fuse-board which is contained in a cabinet of mahogany finish shown at the right of the power switchboard. The repeating coils, of which there is one for each pair of cord circuits, are also mounted in this cabinet to the right of the fuse-board.

The storage battery, which supplies all current for signaling and talking, was manufactured by the American Battery Company of Chicago and consists of type J.—4 cells in J.—7 tanks. The switchboard and all central-office fixtures for this exchange, as well as those of other exchanges of the system, were manufactured and installed by the Kellogg Switchboard and Supply Company of Chicago. The subscribers' wall telephones were made by the Maryland Telephone Manufacturing Company of Baltimore under the patents and designs of the Kellogg Company. The portable desk sets were made by the Kellogg Company.

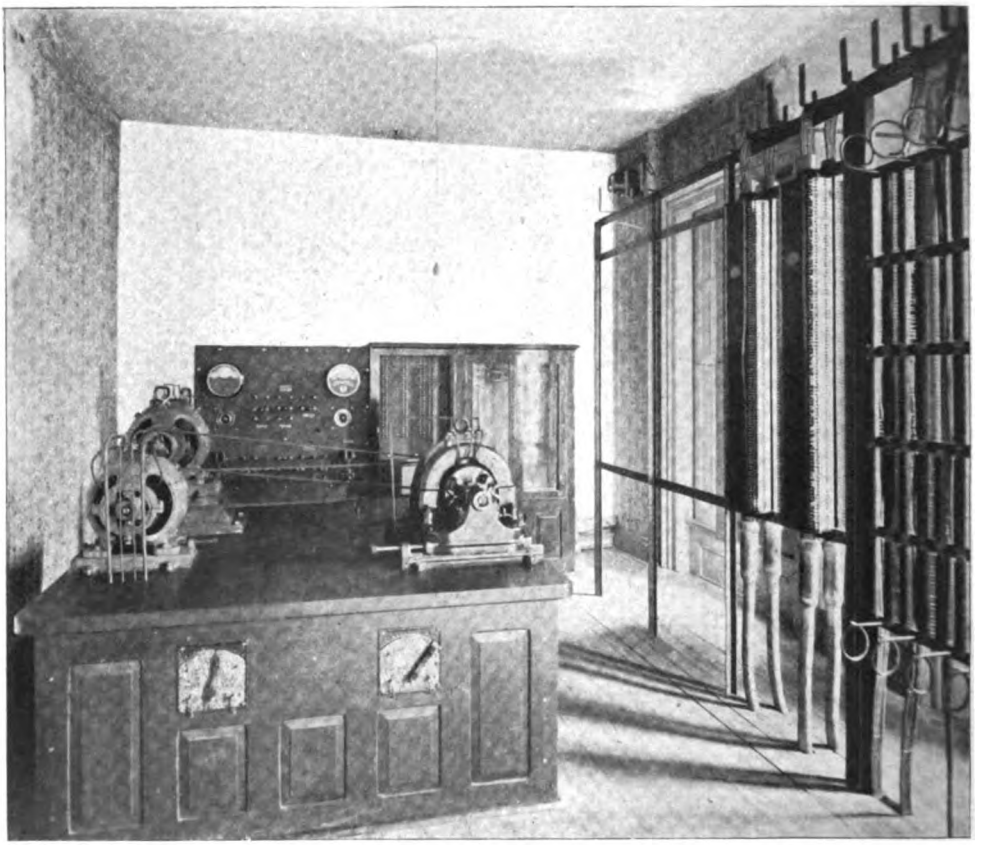

FIG. 3.—POWER PLANT AND DISTRIBUTING FRAMES OF THE NEW SOUTH SIDE EXCHANGE OF THE PITTSBURG AND ALLEGHENY TELEPHONE COMPANY.

ZANESVILLE, OHIO, COMPANY SPREADS.

The Zanesville Telephone & Telegraph Company, which increased its capital stock from $10,000 to $200,000 and secured a franchise from the Probate Court of Muskingum county for building and operating an exchange in Zanesville, combined with the Citizens' Telephone Company and reorganized with S. M. Granger, of the Citizens' Company, as president, and J. B. Rhodes, of the Zanesville Company, as general manager.

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THE MINNEAPOLIS-ST. PAUL EXCHANGE.

As a result of negotiations which have been in progress for several weeks, Minneapolis is assured of the perpetuation of her Independent telephone plant, installed at a cost of some $700,000 in the cities of Minneapolis and St. Paul in 1898. The negotiations have been conducted by Twin City and Chicago capitalists.

Minneapolis will not only have a competing telephone service second to none in the country, but it will be backed by Minneapolis men who are on the ground and to whom patrons can turn for remedy for the slightest impairment of their service.

This condition has been made possible by the enterprise of a number of progressive men whose efforts to place the affairs of the Mississippi Valley Telephone Company on a sound financial basis have been crowned with success.

The plant of the Mississippi Valley Company represents an outlay of nearly $1,000,000 in the twin cities, and exemplifies the best and most modern in telephone construction. This fact, which has been remarked by experts, is a guaranty of the superior service that is promised by the company, now that its affairs are established on an enduring basis.

The name of the company will be changed to the Twin City Telephone Company, and under that name the new corporation will make its bid for public favor. Its officers are Minneapolis men and the entire reorganization has been accomplished by local capitalists. Eder H. Moulton, of the Farmers & Mechanics Savings Bank, will be president, and Joseph Lockey, of the National German American Bank, St. Paul, vice-president. The other officers are William M. Kerkhoff, of St. Paul, secretary and treasurer; Edward E. Webster, Minneapolis, general manager, and C. H. Judson, Minneapolis, general superintendent.

The directors of the new company are E. H. Moulton, Edward E. Webster, of Minneapolis; Joseph Lockey and William M. Kerkhoff of St. Paul; L. A. Trowbridge, of Chicago, and J. C. Hubinger, of Keokuk, Iowa. Mr. Hubinger is the originator of the Mississippi Valley Company, and is the man who put up such a sturdy fight in this territory when he first installed the plant and began his battle with the Northwestern Company.

The importance of the reorganization of the Independent telephone company can scarcely be exaggerated. Not only are hundreds of employes directly affected, but the entire Northwest is interested in the ambitious plans of the exchange.

William M. Kerkhoff, treasurer, was found engaged in signing checks. Said he: "I have been busy for several days signing checks in payment of the indebtedness of the company, and I am happy to say the last one has been provided for. With so many obligations hanging over it, I wonder that the citizens have been so patient and loyal to the company. The reorganization starts with a clean slate and under the new management all bills will be paid promptly. An application for the discharge of the receiver will be made at once. Ample funds have been provided for the contemplated improvements and extensions involving the expenditure of several hundred thousand dollars in Minneapolis and St. Paul. The present low rates will continue, $4 per month for business 'phones and $2.50 for residences. Our lines are full metallic circuits with one party on a circuit, thus insuring prompt connections."

Edward E. Webster, to whose untiring efforts the credit is largely due for the reorganization, said: "We have an up-to-date telephone plant, second to none in the country as far as it goes, and we now have capital to extend and develop our lines to meet the demands of patrons. Plans and specifications have been drawn for the extension of the system in both the residence and the business sections of the twin cities, and as soon as the frost is out of the ground the work will be vigorously pushed. Lots for substations have been purchased in both cities. Orders have already been placed for cable, wire and other materials. We shall make our bid for business on merit.

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IMPORTANT EUROPEAN ELECTRICAL AND ENGINEERING DEVELOPMENTS AT THE CLOSE OF THE NINETEENTH CENTURY.*

BY WILLIAM J. HAMMER.

The author of this paper has found it impossible to do even scant justice to those subjects which he has selected without going somewhat fully into details in each case. He will not attempt to read it in full, but endeavor to present the salient points.

THE TELEPHONOGRAPH.

The telephonograph, or, as it is sometimes called, the "telegraphone," the "microphonograph," and the "magnetophonograph," is the invention of a Danish electrical engineer, Mr. Waldemar Poulsen, of Copenhagen, Denmark. This beautiful and ingenious instrument was considered by all those who had the

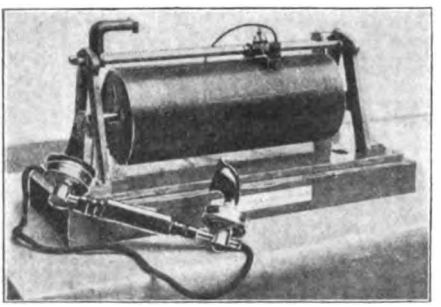

FIG. 1.—POULSEN'S STEEL WIRE TELEPHONOGRAPH.

opportunity of seeing and testing it at the recent Paris Exposition to be the most interesting scientific novelty there exhibited. In principle it is so simple it seems remarkable that, with all our familiarity with electricity and magnetism, such an invention should not have been made long ago. The apparatus, which is indicated in Fig. 1, consists of a drum of brass about 11½ inches in length by 5½ inches in diameter. On this drum, which is revolved by means of an electric motor, is wound 225 turns of steel piano wire, of a diameter of about 1 mm. Supported above this wire, but not in contact therewith, is a tiny magnet, such as are shown in Fig. 2, letters A and C, which are almost natural size. This magnet is attached to a brass support, mounted on a shaft, so that as the drum or cylinder carrying the steel wire revolves, the magnet is caused to move from right to left across the drum, being guided by a grooved finger, resting

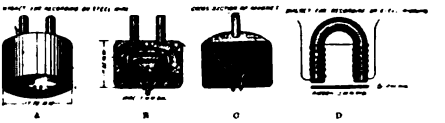

FIG. 2.—TELEPHONOGRAPH MAGNETS.

upon the steel wire on the drum, each turn in the steel wire passing consecutively before the poles of the tiny magnet. On reaching the end of the cylinder an arm mounted on the left side of the frame strikes the tiny lever shown in the illustration, raising the magnet and causing it to run rapidly back to the beginning again (the carrier being guided by the coarse threaded shaft, shown parallel to the supporting shaft) this operation taking but five seconds. The legs of this magnet are about 7-16-inch long, and are wound with bobbins of wire of

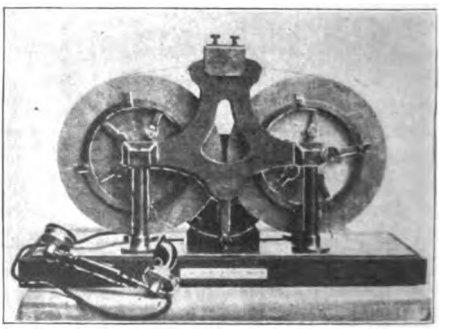

FIG. 3.—POULSEN'S STEEL BAND TELEPHONOGRAPH.

about the same size as those employed on an ordinary receiving telephone magnet. A cross-section of the magnet is shown in Fig. 2, letter C. It has been found that a horseshoe form of magnet, as shown in Fig. 2, letter B, will not respond rapidly enough, and it is preferable to employ two separate magnets electrically connected, as shown in Fig.

* A paper presented at the 151st meeting of the American Institute of Electrical Engineers, New York, February 28, 1901. President Hering in the chair.

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2, letter C. In the ribbon form of telephonograph, the horseshoe magnet shown in Fig. 2, letter D, may be used, but even here two magnets electrically connected are preferable. This recording electromagnet, which has a resistance of 100 ohms, is connected in circuit with an ordinary carbon telephone transmitter, and a couple of cells of battery, and preferably with an induction coil in the usual manner. When the transmitter is spoken into, it acts as a tap upon the battery, and causes currents of varying strength, and in proportion to the strength of the sound waves impinging upon the diaphragm, to pass thru the wire wound on the electromagnet. Now, as the steel wire wound on the drum passes in front of, but not in contact with the poles of the magnet, its varying magnetic field magnetizes transversely the steel wire, and the "lines of force" are permanently recorded therein. After the steel spiral has been filled, which operation takes about 39 seconds at an ordinary speed of talking, and records 100 to 120 words, the tiny magnet is placed at the point where the record first started, and in place of the transmitting telephone with which it was connected, a Bell receiving telephone is attached. The cylinder or drum again revolves, and as the magnetized steel wire passes before the poles of the electromagnet, it forms a species of magneto-electric generator, giving out currents of electricity of a strength and direction corresponding to the magnetization of the steel wire, which correspondingly affect the Bell telephone, and reproduce the sounds and words originally spoken with absolute fidelity. In Edison's phonograph and its modifications, such as the graphophone, gramophone, etc., a stylus is always employed to indent the surface of wax, metal, or other yielding substance. The stylus resting upon such a surface, and being attached as it is to the vibrating diaphragm of the phonograph transmitter, is affected by the dampening effect of the needle or its inertia, and the higher harmonics are more or less destroyed, and there are also false sounds produced, due to the molecular disturbances in the needle and diaphragm itself. Altho Mr. Edison has recently made remarkable improvements in the perfection of recording and reproducing by means of his phonograph over his earlier forms, there are difficulties such as I have referred to, which it has heretofore been impossible to overcome. In Poulsen's telephonograph, however, the tiny magnet not being in contact with the steel wire, the lines of force are silently stored up, and without being affected by external influences. The author has had considerable experience in working with various types of phonographs, and was accorded facilities to examine and operate the telephonograph, both at Paris and at Berlin, and still more recently here in New York. In Berlin, Messrs. Mix and Genest have for some time past been conducting a laboratory for experimental development of the telephonograph, and thru their courtesy, and that of Director Zopke, I was afforded the pleasure of visiting this laboratory, and saw some very interesting developments in this promising field. I found the instrument would record and reproduce the most delicate sounds, even breathing and very low whispering, and certain words, which those who have had experience in working with the phonograph know have always been very difficult to record and reproduce perfectly. All have been taken care of most perfectly by the telephonograph. If it is not desired to retain the record made upon the steel wire, the recording magnet is placed at the end of the drum, and connected with a couple of cells of battery, which supply a constant magnetizing current to the magnet, which entirely obliterates the records which had been stored up in the steel wire, as this wire is passed before the poles of the magnet. A permanent magnet may also be employed for this purpose.

Another type of instrument which Mr. Poulsen has designed is shown in Fig. 3. This consists of two reels, carrying a band or ribbon of steel about 3-16-inch wide and about 1-32-inch thick. This steel ribbon, which may be made of any length and which may be recorded upon for an hour or more at a time, is passed from one reel to the

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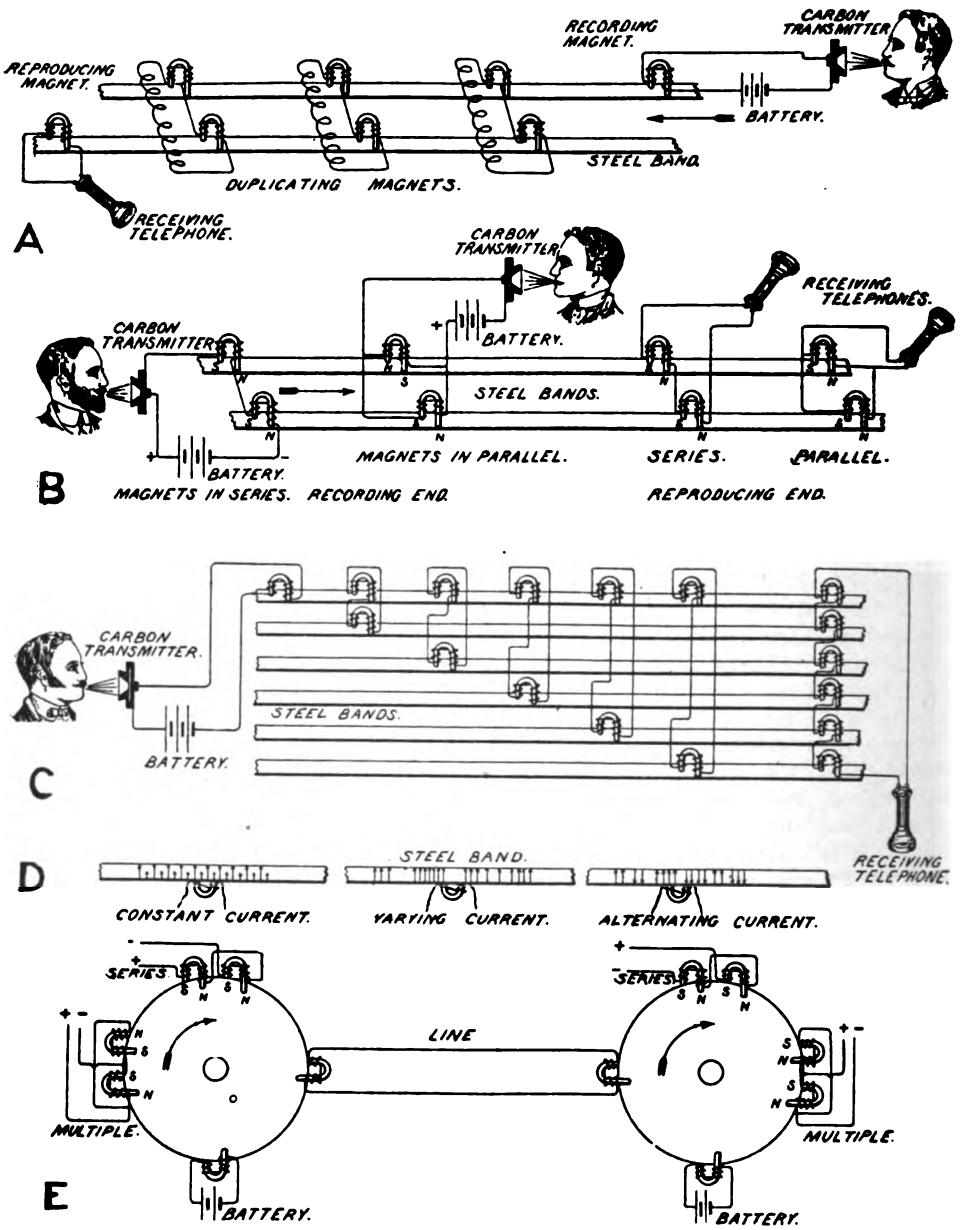

FIG. 5.—PROPOSED METHODS FOR INCREASING VOLUME OF SOUND AND FOR DUPLEXING.

other — the reels being operated by a small electric motor. Above the steel band or ribbon is placed a tiny electro-magnet of the form shown in Fig. 2, letter D, which is connected to a telephone transmitter and battery, in the same manner as in the instrument already described, and after a record has been made, is also connected to a Bell telephone, as a reproducing instrument. It is stated that these steel ribbons, after receiving the magnetic record, could be wound in many layers, similar to a spool or bobbin of ribbon, without affecting the record, and that the record could be reproduced thousands of times. It is

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said that a record has been reproduced 2,200 times and has still been very perfect, and such a spool containing a record could be shipped across the country and placed on another machine, and would reproduce the sounds which originally caused the record with absolute perfection, and even a rusty wire containing a record has been sandpapered and polished without affecting appreciably the record. In Fig. 5, letter D, is indicated, first, how the steel band is magnetized by the obliterating magnet, then by the varving field of the recording magnet, and finally, by the reversal in direction. The Poulsen telephonograph in its ordinary form does not speak louder than an ordinary Bell telephone. I would suggest the employment of Edison's "electro-motograph" or "chalk" telephone receiver, by means of which it could be made to speak very loud. (An audience of five thousand has been able to hear perfectly this Edison's loud-speaking telephone.) Mr. Poulsen has suggested a number of other methods by which the sound could be augmented. It is claimed that by increasing the speed during reproduction, over that of the recording speed, that the telephone speaks much louder. This would, however, tend only to increase the pitch and not improve the volume of the sound. Other methods suggested by Mr. Poulsen are indicated in Fig. 5, letters A and C. They consist in substance of methods for causing one transmitter to make a number of records on separate steel wires or bands which, on repeating, cause the various reproducing magnets to simultaneously affect the one telephonic receiver. It has also been proposed to utilize the telephonograph as a talking newspaper. In Fig. 4 is shown a method which it is proposed to employ. As the steel ribbon which, in this particular form is endless, and which is receiving the record, passes from one reel to the other, as indicated by the arrows, it passes consecutively before each of the receiving magnets, which are shown in horseshoe form, but which may also be single pole, and the subscribers, whose telephones are attached to these magnets, are thus constantly being supplied with the latest news of the day, stock quotations, etc. After the ribbon or band has passed before these magnets, the obliterating magnet wipes out all of the magnetic lines of force stored up in the steel band, and it then passes on to receive fresh impressions from the recording magnet and telephone. In this connection I wish to say that in Budapest I recently found a talking newspaper system being run in connection with the supplying of music, and talking from the theaters by means of the "theatrophone." During the day the subscribers were constantly being informed of the latest news of importance. This service which supplied many thousands of subscribers was independent of the regular telephone service. I also remember equipping the Theatrophone Company in Paris in 1889 with two Edison phonographs for a like purpose — this being the first attempt in this direction. Many suggestions have recently been made for employing the telephonograph in telegraphic and tele-

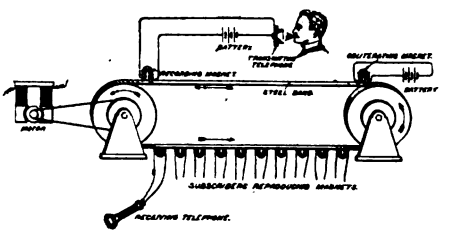

Fig. 4.—The Talking Newspaper.

phonic work, just as were made many years ago when Edison invented his phonograph. It remains to be seen how important the practical applications of this wonderful scientific instrument will become, but it is self-evident that any invention possessing such intrinsic merit is certain sooner or later to meet with important commercial applications. The author, in common with many others, has used the phonograph in his office, dictating at his convenience his correspondence upon the cylinders, from which it was later transcribed by the typewriter. He was recently shown and operated a form of Poulsen's telephonograph which had three magnets attached to the recording magnet carrier, which enabled him to start, stop

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and reverse the movement of the carrier and also obliterate errors in the wire. In Fig. 5, letters B and E, are shown two methods proposed for duplexing. The two sets of magnets are shown. connected, in the one case, in parallel, and in the other in series. These magnets may all be connected in series, or all in multiple, but it is essential that they should be with the proper polar relation. It is claimed that these two sets of recording magnets send waves of a different character over the line, and at the receiving end of the circuit each reproducing magnet will respond to its proper wave. I believe the form shown in Fig. 5, letter E, has never been demonstrated to be practicable, but the one employing the two ribbons shown in Fig. 5, letter B, has been operated successfully. Suggestions have been made for using the telephonograph as a telephonic relay, and I am informed that some experiments have been made recently in this direction, in Europe, and it may perhaps not be out of place in this connection to call attention to the experiments made by the author in employing the phonograph as a telephonic relay at the time of his lecture on "Edison and His Inventions," delivered before the Franklin Institute on February 4, 1889, which experiments were described in the *Electrical World* of February 16, 1889, and other papers, and subsequently more fully described in the *Electrical World and Engineer* of June 3, 1899. The diagram shown in Fig. 6 illustrates very clearly the arrangement of the two phonographs, four telephones, two sets of induction coils and batteries and other apparatus, circuits, etc., and these experiments constitute, I believe, the first practical form of telephonic relay which has ever been constructed, and which operated with perfect success over 104 miles on the lines of the Long Distance Telephone Company, between New York and Philadelphia. (It is interesting to note that the sound passed thru the air five times, thru fifteen separate mediums, and changed its physical characteristics forty-eight times in transmission.)

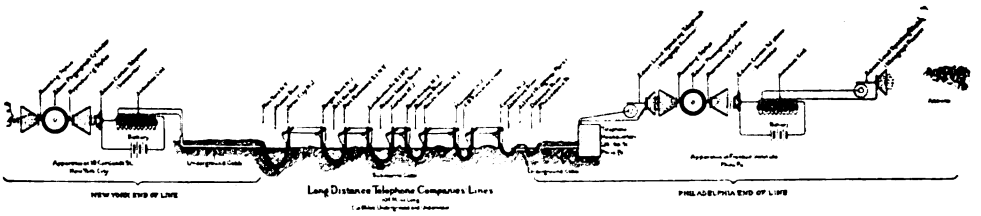
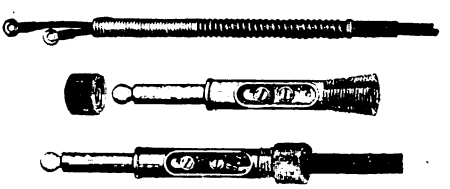


FIG. 6.—The author's Telephone Relay Experiments made on Feb. 4th, 1889.

A GERMAN CORD AND PLUG.

The difference in American and European practice is shown in a description of a new cord and plug for telephone switchboards, made by the firm of C. J. Vogel, Berlin, Germany, which has been employed by American manufacturers in similar form for two years. The first diagram shows the two conductors stranded finely and insulated first with a double lap of cotton, then braided in different colored silk to distinguish the poles. The two wires are then encased in a strong braid. Small contacts are soldered on the wire ends, and the cord is stiffened by a thin winding of whip-cord, which increases to the diameter of the braiding. The plug differs from the usual form in having both an internal and an external screw-thread in the hollow cord end, as shown



in figure 2, the cord being drawn thru the wide shank of the plug and secured by the round nut screwed over the end, as illustrated in Fig. 3. The inner screw-thread by pressing into the outer braid keeps it from raveling. This leaves the cord flexible.

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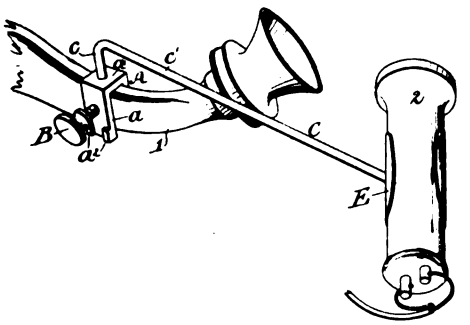
MONTHLY DIGEST OF TELEPHONE AND KINDRED PATENTS

EDITED BY CLARENCE C. BROWN.

Copies may be had, postage paid, by enclosing 5 cents for each one. Address inquiries in care of this magazine or Washington, D. C.

HORACE M. YORK. No. 668,472, February 19, 1901.

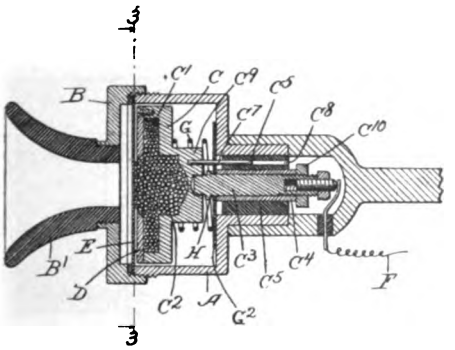
This is another one of those devices for a receiver holder. This device is so arranged for attachment to either the wall or the telephone. The illustration shows it attached to the telephone.



No. 668,472.

DAVID H. WILSON. No. 668,702, February 26, 1901.

This is a telephone transmitter, wherein the carbon cup which holds the granule is attached to the diaphragm. Referring now to the drawing, a suitable outer cup or holder A is provided with a cap B, to which is attached the mouthpiece B'. Contained within the

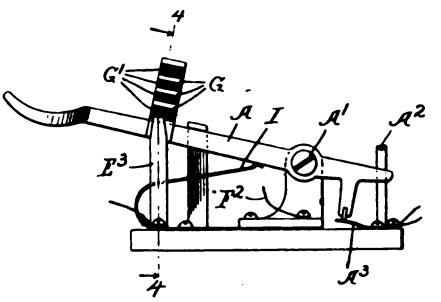


No. 668,702.

outer holder is a carbon holder C, filled with granulated carbon. This carbon holder has an enlarged opening C^1 for receiving the carbon, the holder being recessed at C^2, so as to make the carbon opening deeper at this point. The carbon holder is provided with a projecting pad C^3, which extends thru the holder A as shown in the projecting part which works in the guide C^4, the guide being insulated from the holder A by the bushing C^5. The carbon holder is also provided with means for preventing the rotation of the part C^3 in the guide C^4. In case the part C^5 is circular, some exterior means for this purpose must be made, as for example the pin C^7 attached to the carbon holder and working in the opening C^8 protected by the insulated bushing. In this device, instead of leaving the carbon cup open, there is a guard provided, D, which is attached to the cup and provided with a beveled opening.

WILLIAM O. MEISSNER. No. 668,653, February 26, 1901.

Telephone signal device. This device is arranged so as to do away with the telephone generator or any other



No. 668,653.

method of central signaling. The switch hook is arranged to have a surface made of insulating material, across which there are bars of metal, so that upon lifting the hook these bars of metal pass a spring contact, which is shown in the drawing, which serves to interrupt the current. It is connected in the telephone so that the induction coil receives thru its primary an alternating current, which passes thru its secondary on out to the line, which signals central. One side of the primary of the induction coil

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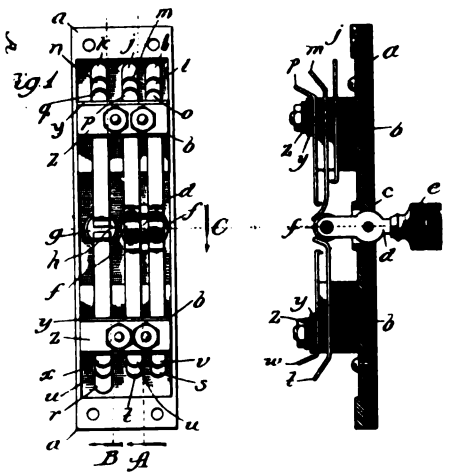
is connected to these strips of metal. The spring E^3 is connected to one side of the battery and the other side of the battery to the other side of the coil. This completes the circuit; and it is also provided that when the switch hook is normally "off" it serves in its regular capacity.

ERNEST E. YAXLEY AND CHARLES C. CADDEN. No. 669,471, March 5, 1901.

Telephone key. This device is another switchboard cam. It is so arranged that the roller C is placed in such a position that when rolled forward it causes the spring to make con-

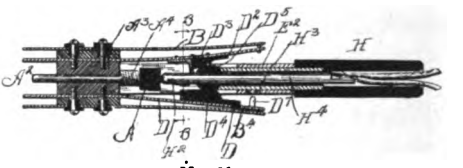


No. 669,471.

tact with the ringing circuit; it does not remain there, but when rolled in the opposite direction it is arranged so it goes beyond its center, which causes it to remain where it is placed. This is the listening position. It is also provided with a button G', so as to ring either backward or forward, that is, to ring on either plug, one plug with the lever movement and the other with the button G.

WILLIAM O. MEISSNER. No. 669,094. March 5, 1901.

This is another form of spring jack. The side of the plug accomplishes the results in the ordinary manner; that is, the springs of the jack are fastened on one piece of insulating material, and another spring, insulated from the first, is fastened to the same piece of insulating material, so that the plug upon entering the jack throws these two metals into contact, also connecting one of these springs to one of its sides. There is a spring rod, A^2, which has an insulated button at its end, which passes

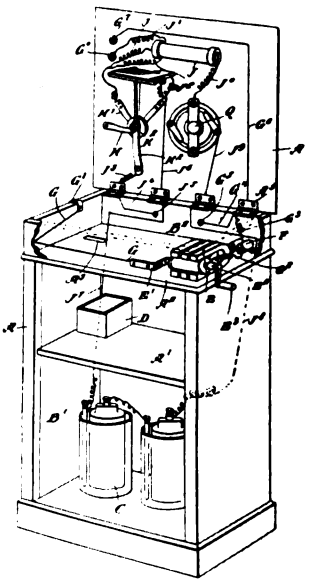


No. 669,094.

thru the block of insulating material which holds the springs. This rod is provided with a spiral spring A^4. Now, when the plug is placed in the jack and the operator desires to ring, she presses upon the plug which bears upon the insulated piece, causing it to slip back and make contact with a ringing circuit. This is supposed to do away with one movement on the cam.

JULIO C. CORDOVEZ. No. 669,875, March 12, 1901.

This is a coin-operating telephone in which a coin must be deposited in order to close the talking circuit. The calling



No. 669,875

subscriber, when the coin is deposited, completes his talking circuit. This device has been tried, but owing to the fact that very often a party calls and does

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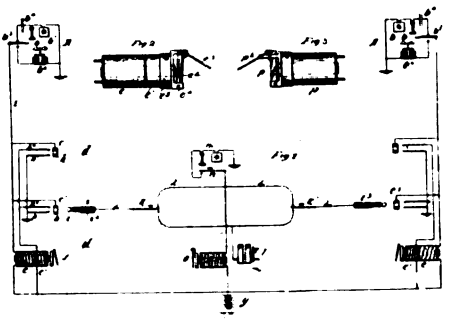
not get his number, it does not compare with other inventions which notify the operator that a coin has been dropped, as when a party is unable to get his number, with this device, the only way he could find out whether or not they were busy would be by depositing another coin. The drawing shows the complete device.

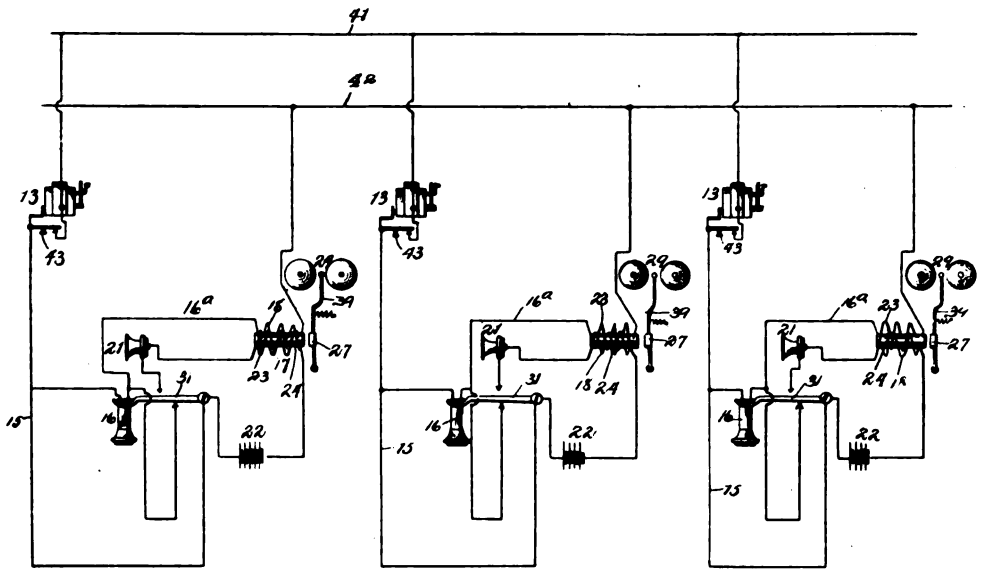
PETER C. BURNS. No. 669,072, March 5, 1901.

This is a party-line device, which has a means for diverting the telephoning current and preventing it from being short-circuited owing to the plurality of telephones which are "cut in" in multiple. In the drawing there is illustrated a party-circuit line of three stations. The arrangement is shown in its relation to the leads 41 and 42 of a complete metallic circuit. The signal sending generator of each station is shown normally cut out of circuit, but the generator circuit may be included by means



No. 669,707.

connecting and disconnecting between substations and the central exchange. The invention is illustrated in the drawing in Fig. 1, which represents the system as applied to a multiple switchboard of two sections, two substations being shown in connection with exchange. Fig. 2 is a side elevation of a line annunciator. Fig. 3 is a similar elevation



No. 669,072.

of the push-button 43. The circuit of this device shows its entire connection thruout.

CHARLES E. SCRIBNER. No. 669,707, March 12, 1901.

Telephone exchange system. This invention relates to signaling appliances and telephone exchanges, and is an improved apparatus for automatically con-

of the clearing-out drop which is employed in this connection. The apparatus at the substation, as arranged, for example, at substation A, consists of a receiver b, a transmitter b^1 and a signal bell b^2, in separate branches from the line, a switch hook b^3 being provided to switch the line into connection with either the telephone or the bell. The

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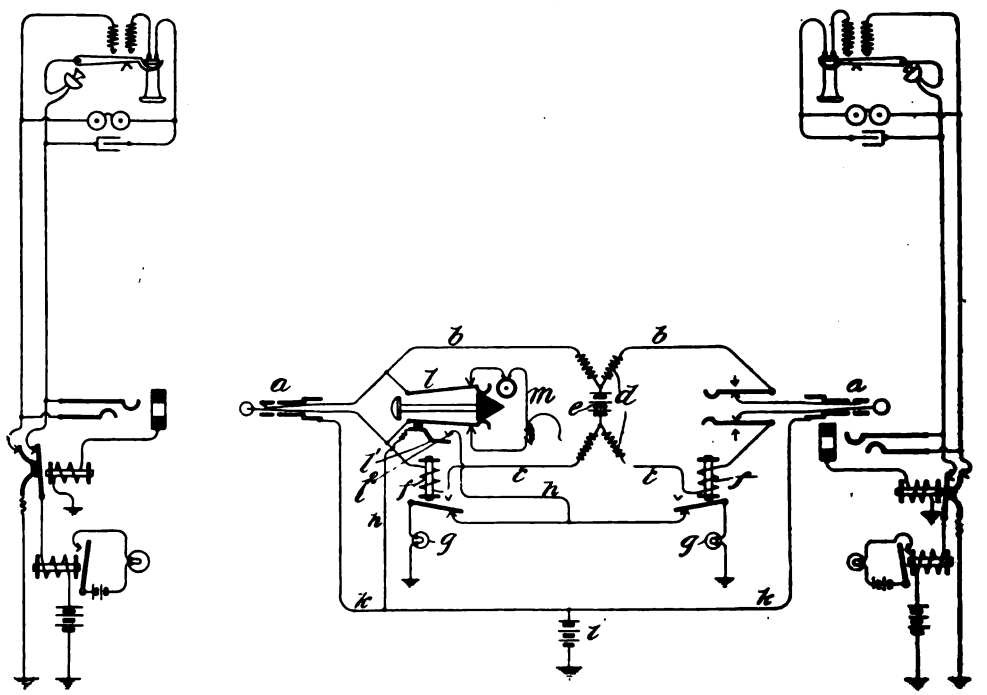
construction of the annunciator *f* is shown in Fig. 2. It comprises a core upon which are wound two helices *e* and e^1, a shutter e^2 which serves as an armature for the core, and a light shield indicator e^3 which is adapted to be operated upon by the shutter e^2. The shutter e^2 is pivoted at its lower edge, and a little to one side of its center of gravity on a trunion e^4, e^5 forming parts of the frame of the instrument.

ORA A. BELL. No. 669,501, March 12, 1901.

This is a supervisory device and consists in the provision of a circuit at the local office associated with a. connected telephone line, a source of current, and a supervisory current, all actuated by means of the telephone at the substation rendering the circuit active or inactive. The operator thus controls the actuating of said supervisory signal and switch contact adapted to be operated by use of her key at the central office, which also controls the connection of the source of current with the local circuit or for otherwise rendering such circuit responsive or irresponsive to current in telephone line. The switchboard illustrated is of the relay type. When the connecting plugs are in their idle position, the listening key is kept depressed, thus cutting off the battery from the supervisory circuit. If the subscriber at one of the substations should desire connection, by removing the receiver from its hook a signal is transmitted in the usual manner, to which the operator responds by inserting one of the plugs into the spring jacks of one of the calling lines. Now the listening key is normally depressed and she may converse with the subscriber immediately to learn the number wanted. As soon as this information has been obtained, the listening key I is relieved, whereby the telephone set is cut out of circuit and the continuity of conductor 8 is completed in its switch contact, thus bringing the supervisory apparatus into action.

CHARLES E. SCRIBNER. No. 669,708, March 12, 1901.

This is a device for signaling and busy test. The object of the first-mentioned feature is for connection and disconnection at the telephone switchboard



No. 669,501.

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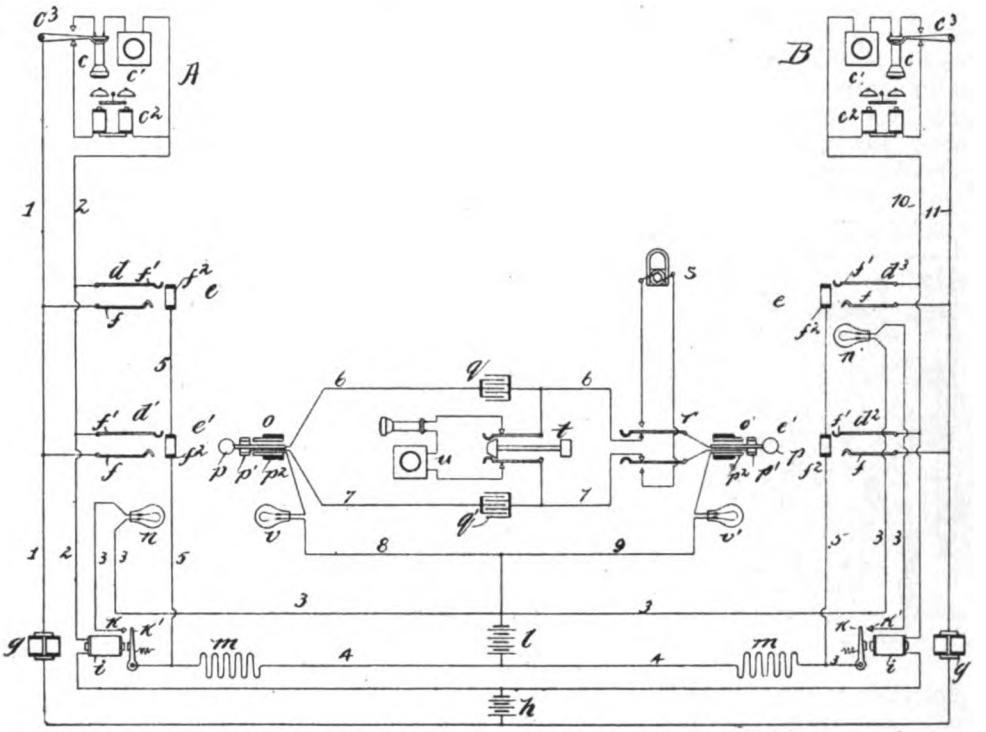
automatically, and to efface the call signal and substitute for this signaling instrument a different signal device adapted to respond to the signaling system. The object for the second feature is to indicate automatically to an operator establishing connection with any line at any section of the switchboard, whether the line be free or not, in order

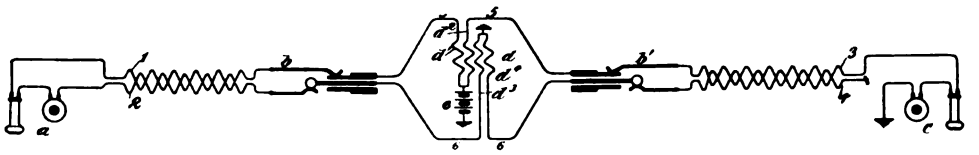


No. 669,708.

that it may not interfere with any connection already existing. In the drawing two substations A and B are shown, each connected thru line conductors with spring jacks, set in different sections of a multiple switchboard, together with a relay controlling an individual switchboard, the relay controlling an individual signal. The apparatus at the substation consists of a receiving telephone and a transmitter and a signal bell C^2, also an automatic switch C^3, arranged to close the line circuit alternately thru the telephonic and signaling apparatus.

FRANK R. MCBERTY. No. 669,545, March 12, 1901.

This is a device by means of which there is an attempt made to eliminate cross-talk where lines are united thru the medium of repeating coils. It also provides the means for avoiding cross-talk in the cable of the switchboard while maintaining the static balance of the line, which tends to prevent inductive disturbance in the lines. The invention is illustrated in the drawing, which represents a metallic circuit tele-



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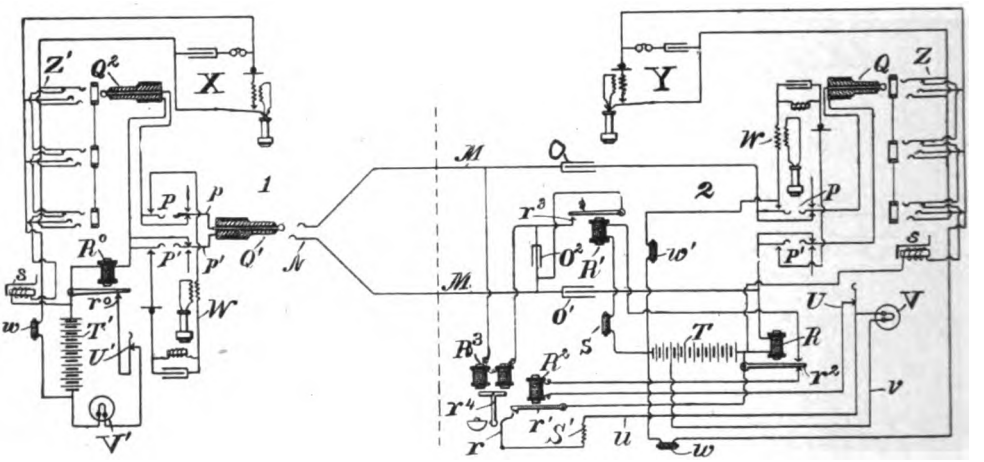
phone line united with a grounded circuit telephone line thru an interposed repeating coil and a bridge-supply battery.

CLARENCE MALTHANER. No. 669,366, March 5, 1901.

Trunking system, together with an order key circuit. It is so arranged that the order key circuit may or may not be used. In this invention the attention of the called operator is attracted by the ringing of a bell and the lighting of a supervisory lamp, which indicates which trunk to answer, thus doing away with the extra lamp and buzzer at present employed in a local

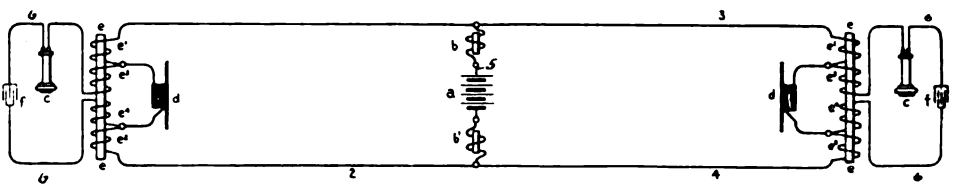


No 669,366.

circuit. The supervisor's signal at the calling operator's exchange, being controlled over the same wires that are used for talking, requires no third wire or ground being employed. The trunk circuit, according to this invention, also overcomes the fault of subscribers being disconnected by either operator before they are thru talking, as the called subscriber controls the supervisor, lamps or signals at both exchanges, thereby giving disconnect signal to both operators simultaneously, instead of one of the operators having to wait for disconnect signal until the other operator disconnects. This enables the connection to be made, supervised and disconnected from either end.

CHARLES E. SCRIBNER. No. 669,710, March 12, 1901.

Telephone circuit to be used in central-battery systems, doing away with the impedance coils. In this invention is dispensed with the impedance coils which have been used in association with the transmitting telephone to prevent the short-circuit of incoming telephonic currents thru the transmitter. The circuit is arranged so there are no connections foreign to the transmitter circuit in shunt about the telephone induction coil. A source of current is disconnected in a bridge of the telephone circuit at the office, and the line of connections at the substation is united by two bridges. One of the windings of an induction coil is included in the undivided portion of the circuit and the



No. 669,710.

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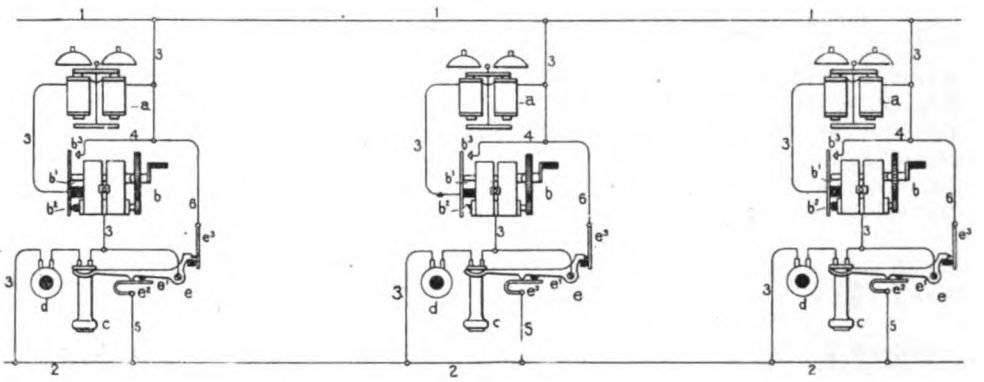
other winding is one of the necessary bridges. The resistance varying transmitter is included in one of the bridges, and an accumulator, such as a condenser or a polarization battery, is included in the other bridge. The receiving telephone is preferably included in the bridge, which possesses the accumulator. This places the receiver in shunt with the transmitting telephone. If the receiver were in series in the line circuit it would still be possible to operate the system, but the impedance and resistance of the receiver would decrease to some extent the efficiency of speech transmission. The drawing represents three telephone lines, which are assumed to be in connection, forming a



No. 669,544.

complete circuit thru the agency of link conductors in a telephone switchboard. In the switchboard from which the lines receive their current supply for exciting the transmitter, the line circuit is furnished with a bridge or cross conductor 5, which includes a source of current A, together with windings *b* of impedance coils B, for preventing the shunting of the telephone circuit thru the bridge.

FRANK H. MCBERTY. No. 669,544, March 12, 1901.

This is another device for party-line telephones. It relates to the signaling and the telephonic appliances and the circuit connections for substations or party telephone lines, the object of the invention being to avoid the loss or obstruction occasioned by some devices which are designed to operate other appliances simultaneously connected in the line at the same station. The invention consists in the combination of the line conductors forming a thru line with a bridge of the line at each substation. Telephones and a generator of signaling current together with a call bell of high impedance is in connection with the bridge; a normally open short-circuit of the bell and generator; a normally closed circuit of the telephone, together with the telephone switch, which is adapted to complete the first-mentioned short-circuit and break the other short-circuit about the telephone while the telephone is in use; a normally closed short-circuit of the generator and a normally open short-circuit of the bell, together with a circuit-closer which is actuated by the operation of the generator and adapted to open the shunt around the generator and to close the short-circuit of the bell. The drawing shows a party line of three 'phones, together with their respective diagrams.

DAVIS S. HULFISH. No. 669,900. March 12, 1901.

This is an automatic meter for registering all outgoing calls where measured service is used. The invention was combined with substation circuits of the common battery or relay type of registering device, being located at the substation end of each circuit. It consists of a mechanical consecutive counter of any suitable design, having a wheel actuated and controlled by the armature of an electromagnet, whose helices are included in one conductor of the circuit, the terminal of which is normally open

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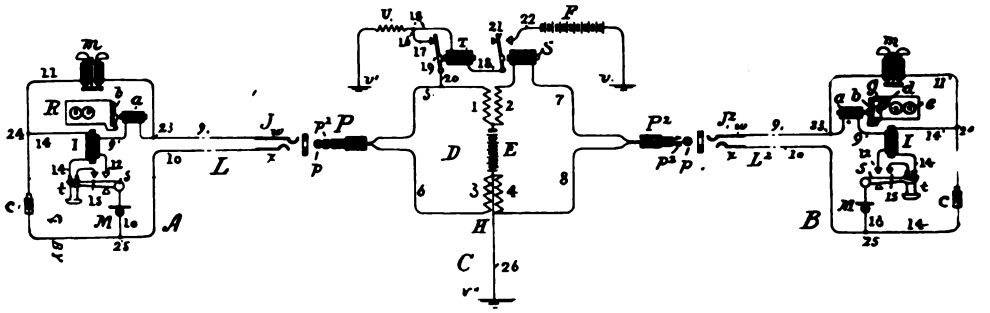
at the switch hook. The potential means for operating the service meter or registering device are located in a link or plug circuit connecting at the central station, and are adapted to become operative when the receiver, at the call from a station, is removed from its station C, at which D represents a linking or plug-cord circuit.

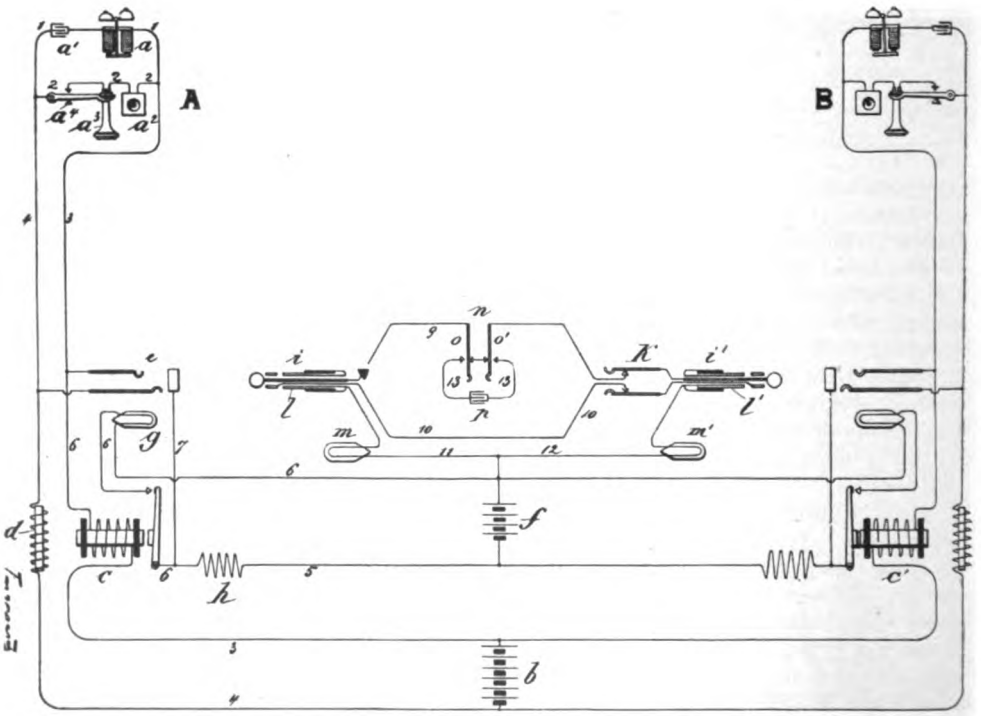
CHARLES E. SCRIBNER. No. 669,709, March 12, 1901.

Supervisory signal for switchboard. This invention concerns signals in switchboards which are controlled in the



No. 669,900.

switch hook, which act thus automatically closes the organized circuit at that point. The drawing which illustrates the invention is a diagram representing two circuits, L and L², extending from the substations A and B to the central use of the substation telephones and are designed to inform the operator of the busy or idle condition of the station apparatus. It is a device for permitting the separate operation or response of the signals to indicate independently



No. 669,709.

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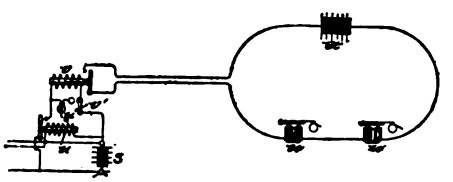
the position of the apparatus at each of two united stations. The drawing represents two telephone lines, terminating in a telephone switchboard at a central station, a single pair of connecting plugs with air-associated appliances being provided at the switchboard. The apparatus at the substation is of a well-known type and arrangement. A polarized signal bell A and a condenser A^1 are induced permanently in a bridge 1 of the line circuit, and a transmitting telephone A^2 and a receiving telephone A^3 are contained in a bridge 2, which is normally open at the contact of the switch A^4. The telephones may be provided with the usual local circuit and current, or may be constructed to operate with current derived from the central station during the use of the instrument. The telephone lines 3 and 4 extend from this substation apparatus, to the central office switchboard. The plug in practice will be equipped with a key for cutting the operator set in circuit. This is not shown. The present invention consists in a key end, whose switch contact is interposed in a conductor 9 of a plug circuit. When this key is in its normal position, the conductor 9 is closed thru a short-circuit between the switch springs o o. When it is thrown in its alternating position these springs break the short-circuit and become connected thru a circuit 13 included in condenser P. This condenser, of course, interrupts the continuity of the circuit, but offers no obstruction to the transmission thru the circuit of alternating telephonic current.

ANGUS S. HIBBARD. No. 669,832, March 12, 1901.

This invention relates to combined telephone and fire-alarm systems. It

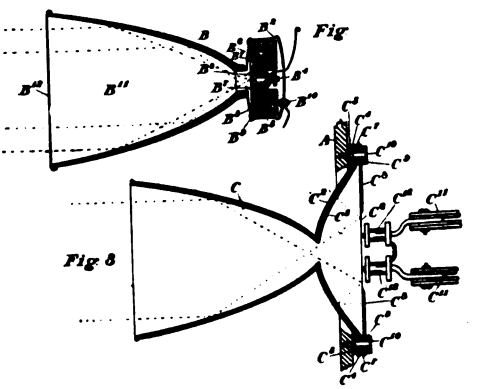


No. 669,832.

provides for an improved means whereby the alarm may, by the aid of apparatus at the telephone exchange, be propagated to alarm stations. This invention is improved upon in a copending application by the same party. The illustration is a diagrammatic view of a modified form of mechanism for propagating currents from the exchange to the fire-alarm station.

ALBION PARRIS MERRILL. No. 669,944, March 12, 1901.

This is a telephone transmitter for the purpose of producing a large volume of sound so it will not be necessary for the



No. 669,944.

instrument to be held at the ear to distinguish or understand the messages transmitted. The further object is the production of a telephone in which it is not necessary for the party sending a message to approach the transmitter or talk directly into it. Fig. 2 shows the transmitter and Fig. 3 the receiver. The mouthpiece is secured in any preferred manner to the transmitter proper, and its inner or operative surface is parabolic in shape. The object of providing the mouthpiece with the inner parabolic surface is to focus the sounds received by the mouthpiece to a given point at the center of the transmitter diaphragm B^9, as indicated by the dotted lines in Fig. 2, thereby concentrating the sounds and increasing the efficiency of the transmitter. The diaphragm B^{12} is conveniently made of bladder, paper, parchment, isinglass or other suitable light material, and is adapted and acts to soften the sounds when the same are too harsh — as, for instance, when produced by brass instruments. The diaphragm B^{12} creates

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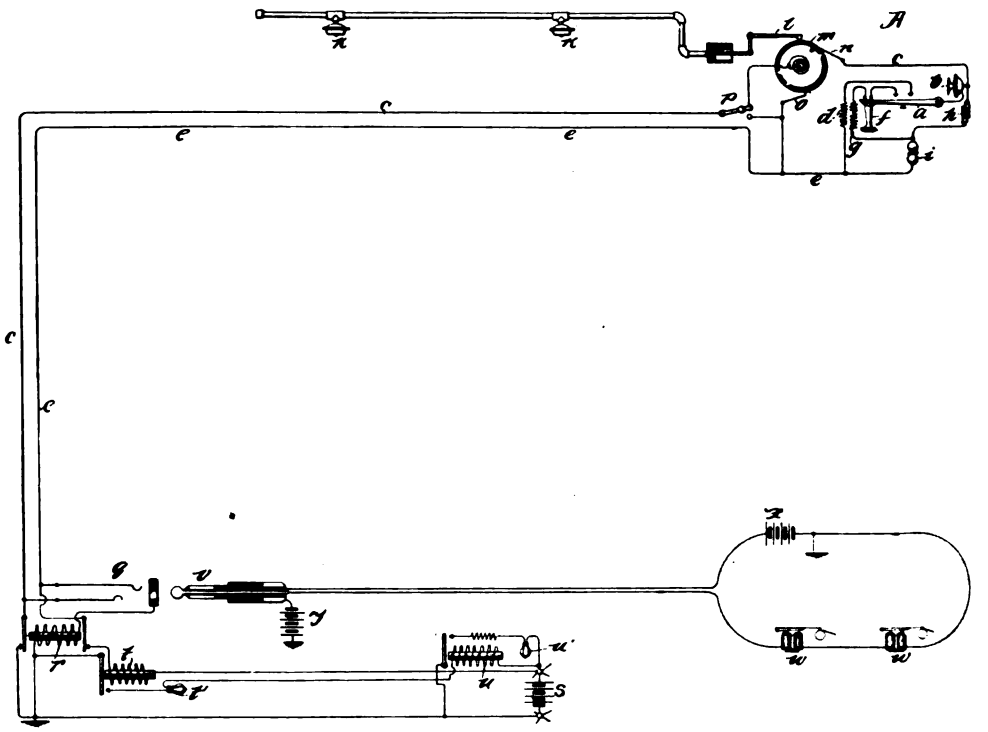
an air cushion in the mouthpiece between itself and the transmitter diaphragm which acts on the transmitter diaphragm. While the diaphragm B^{12} provides better results, the invention is not necessarily limited to its employment, as the receiver will operate in a highly satisfactory manner without it. Referring to the receiver, which is shown in detail in Fig. 3, C indicates a mouthpiece or trumpet comprising two portions, the outer or larger portion having, like the mouth of the transmitter, an inner parabolic surface and the inner or base portion C^2 having a hyperbolic inner surface, which is preferably provided with a lining C^3 of felt or similar material, which is smoothly secured thereto and has substantially the same shape as the inner surface C^2 of mouthpiece. C^2 of the mouthpiece is also provided with a base-securing flange C^4, by means of which it is secured directly to the box A or a door A^5 of the box. Interposed between this flange and the box or the door is an annular washer or pad C^5, its purpose being to prevent the resonance of the wood or other material of which the box is formed. C^6 indicates the diaphragm of the receiver, which, it will be observed, is of comparatively large area and is secured at its outer circumferential edge to the flange C^4, an annular pad or washer C^7 being interposed between the diaphragm and said flange, which pad prevents the metallic sound or ring of the base of the mouthpiece being transmitted to the receiver diaphragm.

ANGUS S. HIBBARD. No. 669,792, March 12, 1901.

This is the improvement upon the telephone and alarm system which has been referred to as No. 669,832. The drawing explains this system. It indicates but one telephone line extending to subscriber's station A. Where it is desired to have a responsive apparatus, at a subscriber's station which will also act to operate alarm apparatus at a fire-alarm station, the means illustrated may be employed. For this purpose is indi-



No. 669,792.

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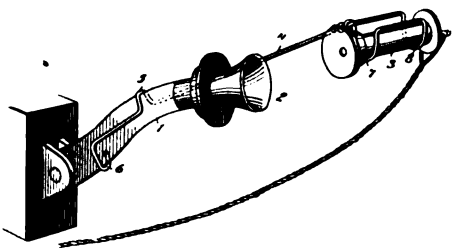
cated a connecting plug *v*, provided with tip and sleeve contacts that substitute the terminals of a round circuit, including alarm or recording apparatus *w w* at the fire-alarm station and a battery *x* to effect their operation. If it is desirable, when the fire-alarm station has thus been connected with the telephone line, to disconnect the signaling apparatus at the telephone exchange, it may be effected by means of the grounded battery *y* connected with the thimble contact of the plug *v* that serves to close circuit thru the grounded cut-off relay *r* upon the insertion of the said plug, whereby the armatures of the said relay are attracted and the battery *s* and the line and the pilot relays at the exchange are disconnected.

MALCOLM C. RORTY. No. 669,901, March 12, 1901.

This is a system which provides private-line telephones having a central source of battery current. That is, it provides for the private line to enter a central station where it can receive an alternating current such as is required for ringing polarized bells, and while telephonic communication is going on it will receive a direct current, and at the same time remain a private line. The circuit at the operating station is arranged in the adopted plan for central battery exchange circuit. The electromagnetic call bell is placed in a continuous branch of the circuit, which also contains a condenser, and the circuit is normally in connection with this branch. The condenser does not oppose the passage of the alternating ringing currents but maintains a circuit in a conductively incomplete condition, so that tho the central source of steady current is normally connected, no current can flow thru the circuit. The drawing shows a telephone circuit containing the invention.

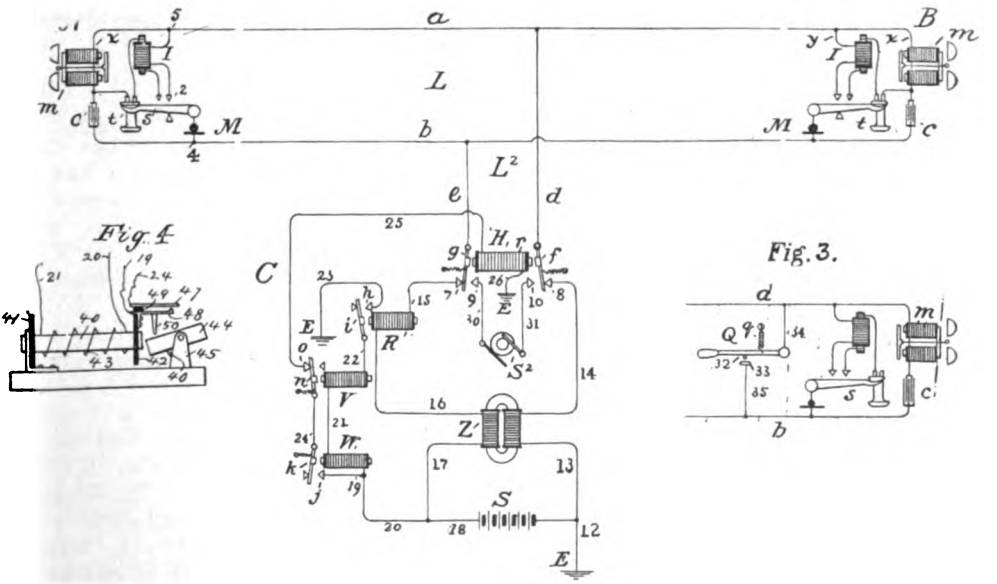
GEORGE S. MEYER. No. 669,800, March 12, 1901.

There seems to be myriads of them,



No. 669,800.

but this seems to be a very simple one and should be gotten up very cheaply. The drawing illustrates it fully.



No. 669,901.

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TRADE NOTES.

THE Standard Underground Cable Company announces the headquarters of its northeastern sales department in the Tremont building, Tremont and Beacon streets, Boston, Massachusetts.

THE Western office of the American Circular Loom Company, now located at 141 South Clinton street, Chicago, will move to 130 Jackson boulevard, Chicago, Illinois, to the Electrical building, at the corner of Jackson boulevard and Desplaines street.

THE Farr Telephone & Electric Company has recently enlarged its quarters and has been compelled to work night and day to keep up with its orders. This company issued a very handsome catalog and it has a number of them which are just waiting the address of telephone men, so send it in.

THE American Electric Telephone Company reports that it has recently installed additional central-energy switchboards in the following places: Bowling Green, Ohio, 150 drops; Salem, Ohio, 100 drops; East Liverpool, Ohio, 100 drops; Wellsville, Ohio, 100 drops; Rome, New York, 125 drops.

THE Western Telephone Construction Company, Chicago, Illinois, reports an unusual run of business and it is constantly increasing its working force. It will be pleased to send you a list of the large exchanges which it has equipped with its types of switchboard. This company issues a little green slip on receivers.

THE Eureka Electric Company, 143 South Clinton street, Chicago, Illinois, has moved into its new factory. The Eureka Company announces that it will be pleased to send a list of descriptive matter which tells about its Eureka express switchboard. This company also issues a very handsome twentieth-century catalog.

THE Erickson Telephone Company, 296 Broadway, New York city, has off the press a new pamphlet entitled Erickson series No. 5, which they will be pleased to mail to any one in the telephone business. This little pamphlet abounds in information pertaining to transportation. This company sends out these booklets regularly, and my advice to every telephone man is to get on that list so they will not miss a number.

THE North Electrical Company, of Cleveland, Ohio, and Chicago, Illinois, will be pleased to send the libretto of its new opera, "To Win Me Favor," recently appearing in its twentieth-century engagement. By way of introduction, they make you a 44-caliber offer. They will be pleased to have your name and address for this offer.

AMONG the recent orders for switchboards filled by the American Electric Telephone Company during the past week are Nelsonville, Ohio, 200 drops; Hartford City, Ind., 400 drops; Mount Pelier, Ohio, 200 drops; Manning, Iowa, 100 drops; Nicholasville, Ky., 300 drops; Timpsonville, Tex., 150 drops; Logan, Iowa, 200 drops; Bluffton, Ind., 300 drops. In addition to the above they have closed contracts for several very important installations for both central-energy and express-type switchboards. The company reports that they have experienced a large increase in business since the Berliner decision.

THE American Electric Fuse Company, Chicago, New York and San Francisco, announces that it has more than doubled its capacity and has installed new and complete machinery for the purpose of turning out its well-known specialties. The American Electric Fuse Company expects to place on the market in the near future various improvements upon its standard lines of fuses, fuse boxes, lightning arresters and connectors. The American Company also manufactures a complete and fine line of both silk and cotton magnet wires and carries a stock of all sizes constantly on hand. The Eastern office of the American Electric Fuse Company is located at 116 Nassau street, New York, and is in charge of Mr. W. B. McCurdy.

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NEW AUTOMATIC SYSTEM.

The National Automatic Telephone Company, Chicago, Illinois, is now placing upon the market what is said to be one of the most compact automatic telephone systems that has ever been devised. This system is the work of Mr. N. E. Norstrom, a young man of several years' experience in the electrical field, and who seems to be very practical in his ideas. He is of Swedish parentage, born in the West. It is arranged so that all parts are readily accessible for repairs and that all contacts are in plain view. The method of operation is at the rod shown in Fig. 1, which travels

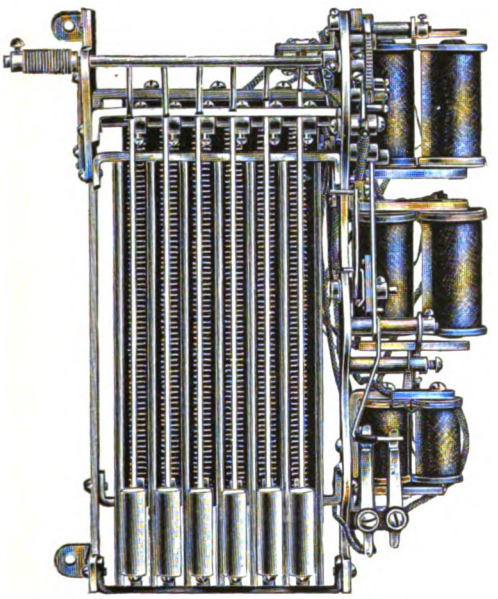

FIG. 1.

up the face of the other device on which is laced platinum wires, each one representing a number. The instrument shown here is switch 500; counting from the right the first strip contains 100 numbers, the second 200, and the third 300 numbers, and the fourth 400, and so on, where the mechanical arrangement and three sets of magnets serve to raise the contacts on any one of the strips at the will of the subscriber. The simplicity of the device is readily seen. This company would be pleased to send its elaborate set of printed matter, together with a full description of this device and a party-service instrument. In the next issue of this paper we have arranged so that we will be

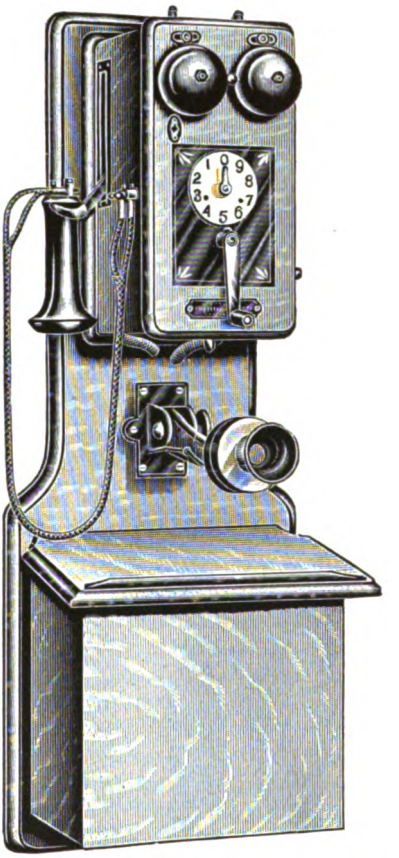

FIG. 2.

able to give a complete description, together with diagrams of these two systems. Cut No. 2 shows the telephone which is intended to work with this system. The dial and working parts are placed in the magneto box. The mechanical arrangement of this is simplicity itself.

AN ENTERPRISING JOURNALIST.

H. Harrison Simpson, editor of the Pilot Grove (Mo.) *Enterprise,* has a telephone project under way which promises to develop into a big telephone system. He began by running short lines to near-by towns for gathering news, but the lines paid so well that he extended them, and has now decided to run them into Sedalia and Boonville.

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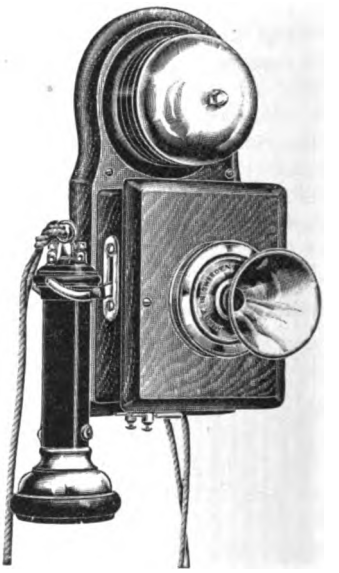
MODEL HOTEL EQUIPMENTS.

In the model hotel or apartment house of today, telephones are quite as necessary as the elevators and mail chutes. After many unfavorable experiences, architects, engineers and contractors have gradually discarded the cheap and inefficient telephone apparatus and are choosing more for quality and durability than price. For these reasons the New Hotel Essex, at northwest corner Fifty-sixth street and Madison avenue, New York city, is equipped with genuine Ericsson telephones and switchboard, which give quick communication from every suite and hall to the office and place the management within easy reach of every patron. The room telephones are all of the hand microtelephone pattern, as shown in cut A, and instead of being

A.

a disfigurement to the wall, they serve as an ornament to the finely finished suites. Each of these is fitted with a flexible cord of sufficient length to enable the patron to call the office or to answer a call if desired without rising from the couch or bed. When thru using, the releasing of a lever in the handle makes and breaks all necessary connections and it is not necessary to replace on a hook, as in ordinary telephones. When first introduced, the hand microtelephone was considered a curiosity, but its utility and compactness has made it a great favorite and it bids fair to soon take the place of the once popular nickel desk set and in



B.

many cases replace the wall instrument as well. In operation, the office is called by simply pressing the contact in the handle of the hand microtelephone, which act throws the drop at the switchboard. The operator connects in the usual manner, answering the call, and if desired, calls some other suite and enables the two to converse. The call to the suite is made by a small musical gong placed near the ceiling, which, while loud enough to call a person, is not harsh enough to disturb one. As shown in cut B, the wall telephone for use in the halls is neat, compact and takes small space. It is fitted with the standard Ericsson receiver and transmitter, now so well known. In operation it is used in the usual way, the act of taking the receiver from the hook sending the call for the operator in the office. With both instruments, when the line is released, the operator is at once notified and quickly disconnects. The switchboard is shown in cut C, and be-

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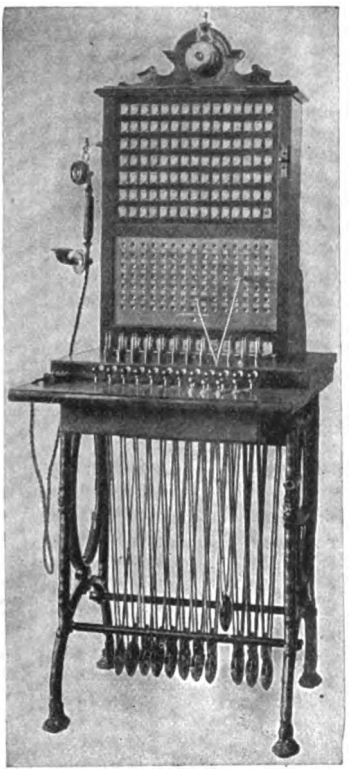
sides being positive and rapid in operation, it is of the finest mechanical construction, is very durable, is handsomely finished, and while occupying very little space compared to its capacity is of a peculiar design which distinguishes it from ordinary boards. The system is operated by centralized batteries and is so arranged that, when desired, a motor



C.

generator can be thrown into circuit for calling.

In addition to this system, the Ericsson Telephone Company, 296 Broadway, New York, makes a number of different systems and telephones of special design and finish for special uses, including intercommunicating patterns and for exchange use. If you are interested you will do well to write them.

FENCE LINES IN TEXAS.

"There is one class of telephones in Texas," says Col. J. R. Haggin, "that never gives rise to any trouble about rates. I refer to the barbed wire lines that have lately received a good deal of attention in the papers. The first one I ever saw in operation was installed on the ranch of Col. Macon G. Cooper, on the Colorado river, southwest of Brownsville, Colorado. Colonel Cooper has a big tract at that point, and his wire fences aggregate thirty-five miles in length.

"Some years ago one of his cowboys, a young man named Elliston, who had been educated in a technological school at Philadelphia, told the Colonel that he could use the barbed wire fences for a telephone service between the ranch house and a shack occupied by the assistant foreman, about ten miles away. Several telegraph men, who were surveying a new route thru that territory, were on the place at the time, and they gave poor Elliston what we call in Texas the mustang ha ha. They pointed out to him that the lack of insulation made his scheme absolutely impractical and absurd, but he held his ground, and finally offered to pay all the expenses of installation if the thing didn't work.

"So Colonel Cooper sent up to St. Louis and bought the necessary instruments and batteries, and Elliston did the work himself. It was a perfect success, and has been in operation ever since. The only interruptions are during heavy rains, when the posts become soaked with water, but that isn't serious enough to interfere with the practical usefulness of the line. The barbed wire is of the ordinary kind, and the attachments are made with common iron brads.

"Why no insulation seems to be necessary is something I am not enough of an electrician to explain. There are at present a number of other barbed wire telephones thru the cattle country, and new systems are being installed all the time. I have talked as far as twenty miles over a fence, and while there is considerable buzzing, or 'frying,' as they call it, on all such lines, I had no difficulty either in hearing or making myself understood."

There would be an "aching void" without THE TELEPHONE MAGAZINE.

LEWIS E. KENT.

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A MODEL ORDINANCE.

Town councils are apt to greatly overrate the importance of a telephone ordinance. They frequently want concessions and provisions embodied in an ordinance that are entirely out of the question. The weight of their responsibility in the protection of their village trust is greatly in excess of the value of the franchise asked for. A simple grant of the right to use the streets and public places for a telephone line is all that is necessary for the protection of the village or the exchange. The following ordinance in full may help out some embryo exchange by showing their village council the kind of franchise other councils grant:

"An ordinance granting permission to the American Telegraph & Telephone Company of Pennsylvania, to construct its lines of poles and wires upon and along the public highways of the Borough of Yoe, County of York, and State of Pennsylvania, upon the terms and conditions therein stated.

"Be it ordained by the Town Council of the Borough of Yoe, County of York, and State of Pennsylvania, that the American Telegraph & Telephone Company of Pennsylvania, its successors or assigns, be and the same are hereby granted the right, privilege and authority to construct, operate and maintain its lines of poles, wires and fixtures upon, along, over and under the public highways of the said Borough of Yoe, upon the following terms and conditions, namely:

"1. All poles shall be reasonably straight; they shall be located under the supervision and direction of the Committee on Streets of said Town Council and shall be so placed as not to interfere with the ordinary use of said highways or so as to obstruct ditches, drains or entrances to gateways or driveways.

"2. Said Company shall hold said Borough free and harmless from any and all damages caused by the construction or negligent maintenance of its said line in said Borough.

"3. Said Company shall be subject at any and all times to any and all general ordinances now existing or that may hereafter be passed relating to the use of public highways or other public places in said Borough.

"4. In consideration of the rights and privileges herein granted said Borough shall have the right to attach the wires of its fire alarm and police telegraph system to any and all poles erected under the provisions of this ordinance.

"5. This ordinance shall take effect and be in force from and after its passage. AARON Y. SNYDER, Pres."

NO EXCLUSIVE PRIVILEGE.

The ruling of the Supreme Court in the case of the State of Washington and the Spokane & British Columbia Telephone & Telegraph Company, appellants, against the City of Spokane, respondent, has been received by Corporation Counsel Dudley. This is the case involving the right to establish telephone lines in the city for the purpose of establishing an exchange in this city and to compel the granting of a charter.

The decision cites the arguments of the counsel for the appellants. In this case the appellants principally argue that by refusing to grant the privilege to a second company it violates the law concerning exclusive grants. With reference to this the court says:

"The argument against the power to grant an exclusive privilege is sound and is fully sustained in the rule announced by this court in North Spring Water Company against the City of Tacoma. But the question of the power to grant an exclusive privilege can not arise here. If the city had attempted to grant such privilege to a telephone company so as to disable itself from consenting to the construction of another telephone system thru its streets, such attempt would be void and beyond its power.

"The city can not by ordinance or contract disable itself to consent to the erection of telephone lines upon its streets. The violation to consent or refuse is one of the powers vested by the legislature in cities of the first class, and this continuing power can not be divested without the sanction of the legislature."

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TELEPHONE NEWS.

COLORADO.

GREELEY, COLO.—The Independent Telephone & Construction Company, which was incorporated with a capital stock of $50,000, is a local company with headquarters at Greeley. It is said to be the intention of the company to make connections with the ranch houses of Weld county. The company has no connection with the Colorado Telephone Company.

PAGOSA, COLO.—E. K. Caldwell, of Pagosa Junction, is willing to put in an exchange.

WOODLAND, COLO.—P. T. Laugenour and B. G. Peart comprise the committee appointed by the subscribers to the Woodland and Knights Landing telephone line.

DAKOTAS.

ALSEN, S. D.—A telephone company was organized known as the A, B and E Telephone Company, of Alsen. A hundred shares of stock were issued at $5 each, which was taken principally by farmers in the vicinity of Alsen. The new company promises to run a line via Emmet to Beresford from Alsen and there connect with the long distance telephone. The following officers were elected: C. B. Jacobson, president; A. Hendrixson, vice-president; Andrew Anderson, secretary; Rev. Father Traynor, Peter Lass and C. B. Thompson, board of directors.

MANDAN, N. D.—Articles of incorporation were filed this week for a telephone company to be known as the Mandan & Northwestern Electrical Company. The capital stock is $25,000 and the incorporators are C. E. V. Draper, C. F. Massingham, C. M. Whitmer and C. F. Miller.

FLORIDA.

BARTOW, FLA.—John F. Leuger, of Niobrara, Nebraska, has been in Bartow for a few days, with a view of putting in a telephone exchange.

PENSACOLA, FLA.—J. L. Hays and associates, of Tallahassee, C. J. M. Shine and associates, of Jacksonville, and the Southern Bell Company are seeking telephone franchises from the city of Pensacola.

TAMPA, FLA.—Brorine & Huffman, with a capital stock of $200,000, ask for a franchise for a new telephone system in this city. Underground wires, and connections with all towns and hamlets in fifty miles' radius as soon as can be constructed, are promised. They guarantee also to make connection with Jacksonville in less than a year. They represent an Ohio syndicate that is putting systems all thru the Southwest and South.

ILLINOIS.

ASTORIA, ILL.— Robert Whitlock will build an exchange.

AVON, ILL.— Presented an ordinance granting to Leonard Cutler and W. H. Beaver, of Abingdon, the right to erect poles and lines and establish and maintain a telephone system.

BARRY, ILL.—William H. Gay, of Rockport, was in the city in the interest of the Rockport and El Dara telephone line. The company desires to extend it to Barry. The company now has lines from Rockport to El Dara, to Louisiana Junction, and expects to build to Barry and Quincy. The Council held a meeting and passed an ordinance granting the El Dara & Hadley Telephone Company the right to enter and maintain its poles and lines in the city of Barry.

BERNADOTTE, ILL.—It is decided to run the telephone line from Bernadotte to Lewistown. The following officers were elected: President, John Lally; secretary, Arthur Brown; treasurer, John Lane.

CAMBRIDGE, ILL.—The Cambridge Mutual Telephone Company, Cambridge, Illinois. Capital stock, $2,500. Incorporators: Theodore Boltenstein, Ernestine Boltenstein and Victor Boltenstein.

CAMBRIDGE, ILL.—Theodore Boltenstein has purchased the two telephone systems, the Central Union and the Mutual, and will consolidate them into one system under a stock company.

CAIRO, ILL.—The Cairo Telephone Company's lines, both long and short distance, owned by Messrs. Thomas W. Gannon and Angus Leek, were sold to Messrs. Marion C. Wright, president of the City National Bank; John S. Aisthorpe, cashier, and others. The Cairo Telephone Company was organized about five years ago by Messrs. Thomas W. Gannon and Angus Leek. Besides the local exchange, they owned lines to Mound City, Villa Ridge and Vienna, and also in Southeast Missouri and Western Kentucky. The new owners will take charge on April 1, and it is understood that they will continue it as an Independent system and will immediately begin work on proposed improvements.

CAMP POINT, ILL.—The Farmers' Exchange Telephone Company, to operate a telephone line. Capital stock, $2,000. Incorporators: J. E. Simmonds, Leonard G. Hoke and Rufus McVay.

CHAMPAIGN, ILL.—A farmers' telephone company has been organized in Champaign county. The company will be known as the Champaign County Telephone Company. It has over 500 subscribers.

CHICAGO, ILL.—The Globe Automatic Telephone Company, to do a manufacturing and telephone business. Capital stock, $25,000. Incorporators: John E. Norling and others.

CHICAGO, ILL.— Independent Telephone Company, Chicago; capital stock, $3,000; manufacturing telephones and appliances. Incorporators: Arthur W. Underwood, I. F. Dunwiddie, J. J. Comer.

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FLANAGAN, ILL.—The village of Flanagan has granted an ordinance to the Middle Division Telephone Company, composed of business men of that city, for the erection of a telephone exchange at that place.

FISHER, ILL.—Fisher is to have a telephone exchange. Coon Brothers, of Rantoul, have been granted a franchise.

GRIGGSVILLE, ILL.— Farmers and Merchants' Union Telephone Company, Griggsville; capital stock, $2,500; operate a telephone system. Incorporators: Angus N. Orr, Adam Zimmerman, J. W. Orr.

GOLDEN, ILL.— Houston Telephone Company, Golden; capital stock, $2,500; operate a telephone line. Incorporators: T. J. Downing, E. J. Hedrick, L. W. Miller.

KENT, ILL.—A franchise has been granted by the city council to Dr. Clay, of Pearl City, permitting him to erect telephone poles.

MILAN, ILL.— H. M. Gilmore and John Beck, of Milan, are circulating a petition among rural Independent telephone users, in the interest of the proposed line to Rock Island. Those to be asked to join in the extension are the patrons of the Monmouth Road Telephone Line Company, Knoxville Road Telephone Line Company, Milan and Taylor Ridge Telephone Line Company and the Ginger Hill and Bowling Telephone Line Company, all of which center at Milan, where they jointly maintain a switchboard.

MCGINTY RIDGE, ILL.—The stockholders of the telephone line that will soon be built thru this burg are: S. W. Scandland and Richard Scandland, of Jacques Mill, Monroe Sides, John D. Northern, Henry and James Simpson, Roger O'Hara, Abe Hersman, John Hense, Orson Simpson and G. W. McCoy.

MACON, ILL.—The Macon-Blue Mound Telephone Company met and elected officers as follows: President, William Schuyler; vice-president, Chris Black; treasurer, Otto Putch; secretary, Carl Bonta.

MORRISON, ILL.—The Morrison and Prophetstown Telephone Company has been organized with president, F. N. Brewer; vice-president, R. A. Bowen; secretary and treasurer, G. P. Fisk.

NEW CANTON, ILL.—A company has been formed in the western part of this county for a new telephone line connecting Rockport, Atlas, El Dara, Horton and New Canton and the various farm houses along the route. E. Gray, of this town, is interested in the enterprise.

PEARL CITY, ILL.— Dr. Clay, of Pearl City, who has been engaged in working up an Independent telephone exchange in this city, applied for a franchise from the town board and the county board.

PLAINVILLE, ILL.—The petition of the Adams-Pike Counties and Hannibal Telephone Company having been granted, the company expects to extend its line to Quincy by way of Fall Creek.

PERU, ILL.—The Utica town board granted a franchise at a called meeting Wednesday to the Northern Illinois Telephone Company. Messrs. Dickinson, of Sandwich, and Robert A. Wylie, of Mendota, are making a canvass for subscribers.

QUINCY, ILL.—A petition from the Adams County Telephone Company, signed by President Hez. G. Henry, of Camp Point, Illinois, was presented to the council.

ROBERTS, ILL.—A company has been organized and a franchise granted to it, known as the Lyman Telephone Company, for the purpose of running a telephone line between here and Thawville. The officers are: Dr. F. S. Diller, president; R. E. Bradbury, secretary and treasurer.

ROCKFORD, ILL.—The Winnebago County Telephone Company ask for a franchise. This corporation has already secured permission of the board of supervisors to wire the county. If the city franchise is secured the company will increase its capital to $250,000, and begin work at once. The parties interested in the company are: George Faulkner, Centerville; C. F. Tritle, Winnebago; James Provost, Pecatonica; W. F. Atley, Durand; F. B. Patton, Sandwich; H. S. Hicks, Centerville; F. L. Tritle, Rockford. The price of 'phones will be $18 for residence and $30 for business. No tolls will be charged in the county.

SCIOTA, ILL.—The latest company organized is the Sciota, Willow Grove & Blandinsville. The company has already been organized with Henry Argenbright as president and Hubert Hainline as secretary and treasurer. James Merriweather is purchasing agent and will buy the poles, wire and 'phones.

SYCAMORE, ILL.— De Kalb County Telephone Company, Sycamore; capital stock increased from $15,000 to $50,000.

TOLONO, ILL.— Perkins & Perkins, of Champaign, will establish a telephone line in Tolono if the village will give them a franchise and subscribe for forty 'phones.

UTICA, ILL.—The Utica town board granted a franchise to the Northern Illinois Telephone Company. Messrs. Dickinson. of Sandwich, and Robert A. Wylie, of Mendota, are making a canvas for subscribers.

VIRGINIA, ILL.—Virginia & Little Indian Telephone Company, Virginia; capital stock increased from $600 to $5,000.

INDIANA.

ALEXANDRIA, IND.—The city council has granted a franchise for a new telephone system to L. C. Nicoson, Joseph G. Brannum and J. H. Bradley.

BEDFORD, IND.—The city council of Bedford granted franchises to three new telephone companies last night, the Hoosier Telephone Company being the largest. Exchanges will be put in and war will be made against the Central Union Company. R. B. Carter, of Smithville, was also granted a franchise. Council granted a franchise to the Carter Telephone Company, and Mayor D. Y. Johnson vetoed it. The council passed it over his veto.

BICKNELL, IND.—The Independent Tele-

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phone Company, organized by Bicknell and Vincennes parties, will begin work on a local exchange here at once. The company will work with the Central Union Company and will furnish long-distance service over the toll lines of that company; it will also build lines to all surrounding villages.

CAYUGA, IND.—I. N. Cartwright and J. F. Randolph, of Parke county, are to build a new telephone line between Cayuga and Silverwood.

ELWOOD, IND.—J. J. Netterville, president of the Anderson Telephone Company, has asked the city council for a franchise for his company to build and maintain a telephone system in Elwood. The Bell Company has now no opposition here, and is operating about five hundred 'phones.

FAIRMONT, IND.—Fairmont & Matthews have organized an Independent telephone company, with R. C. Nottingham president.

FORT WAYNE, IND.—A telephone deal was completed whereby the stockholders of the Home Telephone Company, of this city, purchased from the Telephone, Telegraph & Cable Company, of New York, all the interests represented by the National Telephone Company. The consideration was $120,000. The National company has 1,100 miles of wire, connecting Sturgis, Michigan, North Baltimore, Ohio, Auburn and Kendallville, Indiana, and all intermediate points with this city.

JASPER, IND.—The Dubois County Telephone Company was granted the right to erect poles along the streets and alleys of Jasper for the purpose of establishing an exchange here.

INDIANAPOLIS, IND.—The New Telephone Company will construct new lines from this city to Logansport, Shelbyville and Greensburg; Greencastle and Terre Haute and Greencastle and Rockville. The company has placed an order for $37,000 worth of copper wire.

KOKOMO, IND.—W. N. Turner and C. A. Jay, of the Independent Telephone Company of this city, have made application to the city council of Logansport and the commissioners of Cass county for franchises for a long-distance telephone connecting Logansport and Kokomo.

LEBANON, IND.—The Lebanon Telephone Company has offered all Boone county patrons of the Farmers' Coöperative Telephone Company free service with any of its subscribers, and free service to their homes when in the city. The Coöperative company demands that this offer be extended to all members of the coöperative system, irrespective of county lines, and that patrons of the Lebanon company be granted free communication with the coöperative members. Unless this concession is made the coöperative company will put in a system in Lebanon if a franchise is granted.

The Farmers' Coöperative Telephone Company, with rural exchanges at Thorntown, Advance, Hazelrigg, Elizaville, Shannondale, Montgomery county, has petitioned the city council for a franchise for an exchange in Lebanon.

LAGRANGE, IND.—At a meeting of the directors of the Northern Indiana & Southern Michigan Telephone, Telegraph & Cable Company, last week, Dr. A. G. Hostetler and A. H. Johnston resigned as directors, Frank J. Smith was elected a director and also secretary and treasurer, and A. H. Johnston, manager. The company owns the telephone exchanges in White Pigeon, Centerville and Constantine, Michigan, and all of LaGrange county other than the Griffith or Bell system, comprising between eight hundred and nine hundred 'phones. The company propose to spend several thousand dollars this year in building new lines and improving the old lines.

MANSON, IND.—The citizens of Manson, Clinton county, and the farmers living in the vicinity, have organized a coöperative telephone company, with the following officers: John T. Dukes, president; Marion Anderson, secretary; John Anderson, treasurer; and D. J. Kimmel, general manager. Work of construction will begin at once and connections will be made with Independent companies at this point, Lafayette, Colfax, Crawfordsville, Carlington, Lebanon and Clarks Hill.

MARKELVILLE, IND.—The Wildwood Telephone Company, of Markelville, Madison county; capital stock, $500. Directors: John Biddie, Charles Biddie, Elisha Davis, Lewis Johnson and Charles Fort.

MATTHEWS, IND.—Organized, a new telephone company called Farmers' Telephone Company. R. C. Nottingham, president; Michael Cory, secretary; J. W. Richards, treasurer.

NEWCASTLE, IND.—The Henry County Telephone Company has been organized here with a capital stock of $10,000, which may be increased at the discretion of the directors to $20,000. Many farmers are subscribing to the stock of the new company.

NEW PALESTINE, IND.—The Sugarcreek Township Farmers' Telephone Company, of New Palestine, Hancock county, capital stock, $240.

OKALLA, IND.—Incorporated, Greencastle, Hamrick & Okalla Telephone Company; capital stock $510; directors: O. W. Hauck, John Moss and J. M. King.

PITTSBORO, IND.—The Pittsboro Telephone Company, of Pittsboro. Capital stock, $3,000. Incorporators: Charles P. Sowder, W. D. Lewis, Samuel Janes, John T. Bell, E. W. Sawyer and A. A. Surber. The company will construct lines in Hendricks, Boone and Marion counties.

SCOTTSBURG, IND.—The town board granted a telephone franchise to each of four applicants—Hoosier Telephone Company, Scott County Telephone Company, C. E. Gregory, of Sheridan, and E. E. Dougherty, of Brownstown. Some of these will put in a local system in the near future.

The New Telephone Company has been organized at Scottsburg with a capital stock

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of $5,000. Mark Storen is president; Ervin McCaslin, vice-president; Frank H. Park, secretary; John W. Martin, treasurer; J. Ezra Thomas, superintendent.

WARRINGTON, IND.—The Warrington & Markleville Telephone Company, of Warrington; capital stock, $1,000.

WINGATE, IND.—Brown & Birdsell, of Elmdale, Indiana, have purchased the Bowen telephone system in Wingate.

IOWA.

ALTA, IOWA—The city council submit to a vote of the people of the incorporated town of Alta a proposition to grant a franchise to the Northern Telephone Company, of Fonda, Iowa, for twenty-five years.

AUDUBON, IOWA—Meeting held to run a telephone line from here to Manning, Iowa, with S. F. Garmaire as president and J. A. Cozine as secretary.

BENTON, IOWA—The Diagonal, Benton & Maloy system is to be in operation by May 1. The officers of the company are Ed Dille, president; Ralph Stevens, vice-president; Frank Rychnovsky, secretary; J. D. Dille, treasurer.

BROOKLYN, IOWA—Fred Brown, postmaster of Belle Plaine, was in the city looking over the ground with a view to establishing a local telephone exchange.

BRITT, IOWA—Amended articles were filed with the secretary of state by the Iowa, Dakota & Minnesota Telephone Company. The capital stock is $100,000. The incorporators are Thomas Way, T. A. Potter, E. P. Healy and B. C. Way, of Britt, and Joe Kirby and J. F. McMahon, of Sioux Falls. The capital stock is decreased by the amendments from $500,000 to $100,000.

CARSON, IOWA—Carson will vote on the granting of a franchise to the Carson Telephone Company, which has been organized here.

COLUMBUS JUNCTION, IOWA—Columbus Junction Telephone Company; capital stock, $8,000. N. F. Hendrix, F. M. Molsberry, A. S. Thompson and A. C. Kelly are the incorporators.

DURANT, IOWA—At a meeting of the stockholders of the Wilton, Durant & Bennett Rural Telephone Company, held in Durant, D. H. Snoke was elected president, M. B. Nelson, secretary, and William Bierkamp, treasurer.

GEDDES, IOWA—Articles of incorporation have been filed for the Dakota Telephone and Electric Company, at Geddes, with a capital stock of $150,000. Incorporators: G. E. Wickes, Edward C. Wood and Frank Exline.

GLADBROOK, IOWA—Louis Middledorf and Otto Wettstein have sold the Gladbrook telephone system to an exchange company, which will be known as the Gladbrook Telephone Company, with Frederick Browne, of Belle Plaine, as manager. The new company will extend the lines to Berlin, Traer, Garwin, Toledo. Articles were filed by the Gladbrook Telephone Company, of Gladbrook, Tama county. The capital stock is $10,000. The incorporators are Samuel B. Montgomery, J. A. Davis, Aldine R. Kroh, and Frederick W. Browne.

GRISWOLD, IOWA—Musson Brothers, of Atlantic, Iowa, have submitted a telephone franchise to the people of Griswold to be voted on at the coming election. The proposition is similar to the one made to Atlantic.

KENT, IOWA—The Farmers' Lenox & Kent Mutual Telephone Line will be put in operation, a company having been organized and steps taken that makes its erection certain.

LAKE VIEW, IOWA—The Farmers' Telephone Company has organized for an exchange here. Connection will be made with Odebolt, Sac City, Early and Wall Lake. Charles Irwin has been elected president and B. Broughton secretary.

The new State Telephone & Telegraph Company, which has had a line running into Lake View for some time, has been stirred up to greater activity by the organization of the Farmers Telephone Exchange. The New State Telephone & Telegraph Company has asked for a franchise, which has been granted, and men are at work placing new poles and wires. The line extends east to Marshalltown and west to Sioux City, with the new exchanges added.

LOHRVILLE, IOWA—Lohrville will vote on the question of granting a franchise for a local telephone exchange on the 25th inst. The E. H. Martin Telephone Company, of Webster City, is after the franchise.

MT. AYR, IOWA—Stockholders in various farm telephone lines of Ringgold county held a meeting in Mount Ayr for the purpose of formulating some plan of consolidation. Eight lines were represented: Rice Township Telephone Company, Farmers' Mutual Telephone Company, of Eureka, Mount Ayr, Delphos & Maloy Telephone Company, Delphos & Allendale Telephone Company, Lotts Creek & Riley Townships Telephone Company, Diagonal & Mount Ayr Telephone Company, Mount Ayr & Caledonia Telephone Company and one line from Eureka to Mount Ayr not yet named.

About thirty representatives were present. C. D. Bowles, of Delphos, acted as chairman and W. H. Beall was chosen secretary.

NORTH BRANCH, IOWA—North Branch Farmers' Telephone Company. Cyrus Cope, president; Henry Washburn, vice-president; F. D. Barney, secretary; John Washburn, treasurer.

OELWEIN, IOWA—The Sumner Telephone Company is asking for a twenty-year franchise in Oelwein.

OXFORD, IOWA—Will vote at spring election to grant the F. H. Crow Telephone Line a franchise to construct and operate a telephone exchange in Oxford.

RED OAK, IOWA.—J. A. Anderson, Jr., who has constructed a number of telephone lines in this and adjoining counties and who was the leading spirit in the organization of the Corning Telephone Company, will put in an exchange at Red Oak if the people will vote him a franchise.

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STATE CENTER, IOWA—The State Center-Melbourne Farmers' Telephone Company has been organized with G. H. Carney, president, and T. L. Lynn, secretary and treasurer. The company proposes to build a rural telephone line connecting Melbourne and State Center, securing the services of the local exchange and toll-line connections at the latter place.

SPRING CREEK, IOWA—A telephone company was organized called the Spring Creek Mutual Telephone Company.

UNION, IOWA—Articles were filed by the Union Mutual Telephone Company, of Union and adjacent territory, with $2,000 capital stock. F. Z. Whinery, H. Cady Drug Co., E. A. Hunt, C. B. Wilson and others are incorporators.

VILLISCA, IOWA — Application has been made by the Nodaway Valley Telephone Company for a telephone franchise in the city of Villisca, Iowa, and asking that the same be submitted to a vote of the people.

WATERLOO, IOWA—The announcement has been made by the Sumner Telephone Company that a line will be extended to this city during the coming summer. There is plenty of Sumner capital behind it. One hundred and ten miles of line is now up and in active operation. M. Robish, the local banker of Sumner, is secretary and treasurer of the company. At several points the lines will connect with the Standard, the largest Independent organization in the State. When the line is completed to this county and city it will make a circuit taking in Sumner, West Union, Hawkeye, New Hampton, Fredericksburg, Lawler, Boyd, Oelwein, West Gate, Maynard, Alpha, Waucoma, Richfield, Buck Creek, Tripoli, Waverly, Cedar Falls, Riceville, Osage, Elma, Charles City, Fayette, Arlington and Strawberry Point. The charges made for toll work are ten cents under fifty miles, fifteen cents under seventy miles, and twenty cents under 100 miles.

KENTUCKY.

LONDON, KY.—A. W. Huggins, of this place, has secured the right of way to build a telephone line from here to Manchester.

LOUISVILLE, KY.—The Louisville Home Telephone Company, of Louisville, Kentucky, to construct telephone and telegraph lines in that city, was incorporated at Dover, Delaware, with a capital stock of $1,000,000.

OWINGSVILLE, KY.—The city council granted to the American Telephone Company the right to run its wires into and from this town. The line is to be run from Georgetown, Kentucky, to Charleston, West Virginia.

MAINE.

AUGUSTA, ME.—The bill incorporating the Androscoggin Telephone Company was passed.

LEEDS CENTER, ME.—The legislature passed an act to authorize James M. Moulton to construct and maintain a telephone line between Wayne village and Leeds Center.

PORTLAND, ME.—Telephone bill incorporating the Union Telephone Company with the right to build lines in Union, Washington, Appleton, Hope, Searsmont, Liberty, Montville, Lincolnville and Belmont and for a pay station only, in Belfast. The bill says this company may take land as for public use, the provision being included in section 4, which is as follows:

"Section 4. They shall be granted the right to take and hold, as for public use, any land or route that may be necessary or convenient in connecting the points or places, when it may have the authority to construct the lines subject to the general laws of the State of Maine. The capital stock of said company shall be ten thousand dollars ($10.000)."

MARYLAND.

BALTIMORE, MD.—The Hughes Telephone Company has been incorporated by Messrs. Charles C. Hughes, J. Murray Burrel, Edward L. Ward, George H. Chandlee and Phares M. Mishler. The capital stock is $100,000. The company is formed to manufacture telephones.

FREDERICK CITY, MD.—The Catoctin Telephone & Telegraph Company has been organized at Wolfsville, Maryland. The object of the company is to build a telephone line from Myersville to Wolfsville, via Ellerton and Middlepoint. The incorporators are Dr. Alvey J. Smith, president; Ashbury E. Hoover, secretary; William E. Hankman, treasurer; Upton Grossnickle and Cyrus Flook.

CHASE, MD.—Articles incorporating the Suburban Telephone Company, of Baltimore county, were filed at Towson. The capital stock of the company will be $10,000 divided into 1,000 shares of $10 each. The directors for the first year are Messrs. John A. Sheridan, John W. Crouch, Edward C. Carrington, Jr., Richard Vincent, Jr., Robert McClintock, Joseph Dreyer and C. Ross Mace, all of whom are well-known residents of Baltimore county.

Mr. Carrington, the attorney for the company, stated that its object was to give telephone service to the suburban residents of Baltimore by building lines to isolated points and connecting with the Maryland Telephone Company or the Chesapeake and Potomac Telephone Company for service to Baltimore city and elsewhere. The company's exchange for the present will probably be at Chase, Baltimore county.

CUMBERLAND, MD.—The Woodford Telephone Company, of Elkins, West Virginia, has applied for a franchise to construct a system at Cumberland, Maryland.

TRAPPE, MD.— Dr. W. S. Seymour and Barclay Haskins Craig will build a telephone from Trappe to Manasses, through Landing Neck to Hambleton and thence to Trappe.

TOWSON, MD.—Articles of incorporation of the Perry Hull Telephone Company were filed. The company has a capital stock of $5,000, and the incorporators are John C. Halbert, Leslie W. Baker, Bernard Myers,

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V. Brant Rittenhouse, David De Gruchy, P. Beall and Frederick Daunpelser. The company is organized for the purpose of operating a telephone line in any part of Baltimore county.

TOWSON, MD.—The Suburban Telephone Company was incorporated at Towson.

MICHIGAN.

ALAMA, MICH.—The officers of the Union Telephone Company are G. S. Aldrich, St. Louis, president; J. H. Fildew, St. Johns, vice-president; C. F. Brown, Alma, secretary; G. S. Ward, Alma, treasurer. The articles of incorporation were amended so as to increase the capitalization to $150,000, an increase of $50,000. This $50,000 will be used to build a new copper line from this village to Lansing and install exchanges in the several towns along the route.

CLIO, MICH.—A telephone line is to be put up in the near future connecting Arbela with Clio. Dr. W. H. Taylor, of Clio, heading the movement.

FITCHBURG, MICH.—A new telephone line was inaugurated to be known as the Town Line 'Phone Company. It is to extend from Fitchburg east to town line, thence south to base line and north to the Hickey neighborhood. The following officers were elected: F. Clark, president; C. E. Richmond, secretary; Charles O'Brien, treasurer.

JACKSON, MICH.—J. W. Martin, the telephone promoter, has been granted a franchise for a plant in this city. The maximum rates for three-year contracts are $24 per year for business and $18 for residence 'phones; for a time not stated, the rates are $26 and $20.

OCEANA, MICH.—The stockholders of the Oceana Telephone Company have bonded their company in the sum of $10,000 for the purpose of paying its indebtedness and of extending its service.

ONONDAGA, MICH.—Mr. E. E. Ranney, of Rives Junction, Michigan, is soon to build a telephone line from Onondaga to Tompkins Center to connect with the line of C. W. Cook from Rives to Tompkins Center, and the Parma and Springport lines.

MISSOURI.

BETHANY, MO.—The organization of a corporation to be known as the Farmers' Telephone Company, of Harrison county, was perfected with a paid up capital stock of $2,500. Officers: J. S. Neff, president and general manager; J. C. Ray, secretary; T. F. Gray, treasurer.

BRAYMER, MO.—A company has been organized to put in a telephone circuit taking in Braymer, Roads, Regal and Stet, and will be known as the Stet-Roads-Regal-Braymer Telephone Company. The officers chosen are George Mansure Regal, president; A. J. Penny Regal, secretary; M. H. Toland Braymer, treasurer.

COWGILL, MO.—A company was organized known as the Cowgill & Regal Telephone Company. This line also takes in Georgeville and Ovid, and will maintain a local exchange at Cowgill. E. K. Rea, of Ovid, is president and A. M. Delany, of Cowgill, secretary and treasurer.

FARBER, MO.—A new telephone line is being built from Farber to Hutchinson, a distance of eleven miles. The company was organized by electing R. E. Sisk, president; W. J. Crow, vice-president; C. A. Devault, secretary. and William Lake, treasurer, and is known as the Farber Telephone Company.

GREENVILLE, MO.—Greenville Telephone Company, of Greenville; capital stock, $750. Incorporated by William Woods, J. H. Molengen, J. H. Taylor and others.

KANSAS CITY, MO.—The Terrace City Telephone Company, capital stock, $500, held by Hugh C. Ward, Fred Huttig and Ferdinand Heim, has filed a certified copy of its articles of incorporation with the county recorder. This is the company which will use the subway company's conduits. It is a part of the general plan to give Kansas City competition in telephones. The capitalists backing the company have also plans on foot to establish a new electric light plant here.

POLO, MO.—A company has been formed to build a telephone exchange in Polo. The officers of the company are F. M. Kern, president; M. H. Winger, secretary and treasurer; J. W. Houston; J. D. Vanolinda, C. C. Hopkins, J. B. Bathgate and T. J. Campbell, directors. A farmers' telephone company has also been organized to connect Polo with Lathrop, Mirabile and Kingston.

THOMAS, MO.—Farmers' Telephone Company, of Harrison county, of Thomas; capital stock, $2,500. Incorporated by C. H. Neff, W. H. Springer, R. J. Goodrich and others.

ST. LOUIS, MO.—The American District Telegraph Company of Missouri was incorporated March 5. The capital stock is $100.-000. The incorporators are H. A. Bennett, T. P. Cook, G. J. Frankel and others.

MINNESOTA.

HUTCHINSON, MINN.—Incorporated: The Hutchinson Telephone Exchange Company. Capital stock, $25,000. M. W. Clay, president and treasurer; E. J. Stearns, vice-president; W. S. Clay, secretary and general manager.

The Hutchinson Telephone Company is preparing to extend its lines to Bear Lake, Brookfield and Lakeside.

MANKATO, MINN.—The Mankato Citizens' Telephone Company will construct a line to Rapidan, Garden City and Mapleton, and another to Lake Crystal.

MAPLETON, MINN.—The council of this village has granted a franchise to the Citizens' Telephone Company, of Mankato, to build and equip a local exchange.

NORTHFIELD, MINN.—Articles of incorporation have been filed by Charles Church, H. L. Frye and Phœbe Church, who have formed themselves into a company to be known as the Northfield Telephone Exchange Company. The articles state that it is the purpose of the company to construct and operate telephone

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lines and exchanges, and that Northfield will be the principal place of business. The capital stock amounts to $15,000.

PELICAN RAPIDS, MINN.—The Fergus Falls Telephone Company has decided to give Pelican Rapids a first-class telephone system. Materials for its construction have already been ordered.

WINTHROP, MINN.—The People's Telephone Company has been organized here by the business men, and seventy 'phones will be installed at once. The officers are: President, R. R. Stoner; vice-president, C. M. Peterson; secretary, J. A. Larson; treasurer, C. A. Benson. The capital stock is $10,000.

WEBSTER, MINN.—A. Ross has completed arrangements for instituting a telephone exchange in Webster.

WILLMAR, MINN.—The organization of the Kerkhoven & Hayes Telephone Company was perfected. The following officers were elected: President, J. J. Nelson; vice-president, Halvor Negaard; secretary, A. O. Klopp; treasurer, O. G. Hough.

NEBRASKA.

AINSWORTH, NEB.—A joint meeting of the stockholders of the Keya Paha and Brown County Telephone Companies was held and permanent organization perfected. President, R. S. Rising, of Ainsworth; vice-president, H. L. Millac, of Springview; treasurer, Charles Howe, of Ainsworth. W. H. Williams, of this place, was elected secretary. The authorized capital stock of the company is $3,000.

CALLAWAY, NEB.—Articles of incorporation have been filed for a local telephone exchange at this place, with John Moran, H. H. Andrews, W. E. Shupp, A. L. Mathews and J. D. Weiland as the incorporators. Mr. Andrews is chief promoter of the enterprise.

EWING, NEB.—The Ewing & Deloit Telephone Company, of Ewing, Holt county, has incorporated under the State laws with a capital stock of $5,000. The purpose of the company is to operate telephone lines in Holt county and such other counties as it may desire to extend its lines.

HOOPER, NEB.—The organization of the Hooper Telephone Company was completed. The following officers were elected: T. W. Lyman, president; Bernard Monnich, vice-president; J. Howard Heine, secretary; Jerry Denslow, treasurer; E. E. Shipley, general manager. These officers with A. M. Tillman and E. O. Spielberg will constitute the board of directors. There has been $1,250 of the capital stock subscribed.

NORTH BEND, NEB.—The Farmers' Telephone Company has been incorporated here with a capital stock of $20,000.

PLEASANT VALLEY, NEB.—The Farmers' Telephone Company, of Dodge, has been organized here, with these officers: John Emanuel, president; H. M. Kidder, vice-president; J. T. Drengues, secretary, and H. P. Dowling, treasurer. The following are the directors for one year: Dr. J. M. Doan, North Bend; H. M. Kidder, Scribner; Harry Sievers, Webster; for two years, Elmer Scott, Webster; H. P. Dowling, North Bend; J. T. Drengues, Scribner; for three years, John Emanuel, Pleasant Valley; Henry Hitt, Scribner, and J. C. Newsome, North Bend.

PIERRE, NEB.—The New England Wireless Telegraph & Telephone Company, at Pierre, with a capital of $5,000,000. Incorporators: Francis H. Banks, Thomas B. Bishop, Leroy C. Smith.

PETERSBURG, NEB.—Messrs. D. L. Shenefelt, C. W. Dimmick and L. N. Levalley, of this place, have formed a local telephone company and made application to the village board to operate in Petersburg.

SIDNEY, NEB.—The Auburn Telephone Company is negotiating for a telephone franchise at Sidney.

NEW YORK.

BAITING HOLLOW, N. Y.—Incorporated: Baiting Hollow & Roanoke Telephone Company; to operate in Suffolk county. Directors: W. V. Young, C. V. Young, Charles Werner and G. F. Terry, Baiting Hollow.

BATH, N. Y.—Citizens' Telephone Company, of Bath, Steuben county. Capital stock, $10,000. Directors: B. G. Hubbell, C. B. Stowe and J. H. Fuller, all of Cleveland, Ohio.

JAMESTOWN, N. Y.—The Jamestown & Chautauqua Telephone Company has been granted a franchise. This company will be composed almost altogether of Jamestown men. Messrs. Cyrus E. Jones, Hurley L. Phillips, Henry W. Odell and Charles S. Abbott, upon whose application the franchise was granted, are all leading business men of this city. The maximum rates to be charged under the new franchise is $36 for separate line business 'phones, $30 for two-party line, and $18 single line, $12 two-party line for residences, all unlimited as to calls. A business extension 'phone is not to exceed $10.

LITTLE FALLS, N. Y.—John McCauley and J. J. Gilbert, in behalf of a proposed stock company, asked for a telephone franchise for the city of Little Falls and vicinity. Business phones would not be over $30 and resident phones $15. Alderman Burney said if the franchise was granted it would make three telephone companies in the city and he did not believe they could exist. The matter was referred to a committee.

PITTSFORD, N. Y.—Pittsford will secure a telephone exchange from the Home Telephone Company, of Rochester, thru the influence of Eugene H. Satterlee, an officer of the Home Telephone Company and a resident of Pittsford.

PORT JERVIS, N. Y.—As a result of its increasing business the Port Jervis Telephone Company will increase its capital stock from $9,000 to $15,000.

SAYRE, N. Y.—The Sayre town council has granted a fifty-year franchise to the Valley Telephone Company. Lewis Eighmey and Frank Pike are the prime movers in the enterprise.

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RENSSELAER, N. Y.—Certificate of incorporation of the Rensselaer Telegraph and Telephone Company states that it is the purpose of the company to do a general telephone and telegraph business in Troy, Rensselaer, Watervliet, Cohoes, Schenectady, Green Island and in other cities, towns and villages. The capital stock is $150,000, with the privilege of increasing it to $500,000. Directors for the first year are John H. Gleason, Edward F. Murray, John J. Smith, E. E. Summey, Charles Mahoney, Joseph H. Broderick, Joseph A. McCarthy, W. H. Hollister and Thomas J. Mooney, all of Troy.

WARSAW, N. Y.—The Peoples Independent Telephone Company has applied to the village board of trustees of Warsaw for a franchise. They have plants at Niagara Falls, Tonawanda, Medina, Albien and other places. They name $16 as the top price for residences, and $30 for business places, all service to be on metallic circuits.

WELLSVILLE, N. Y.—Wellsville Telephone Company of Wellsville. Capital stock, $25,000, and directors: B. G. Hubbell, C. B. Stowe and J. H. Fuller, all of Cleveland, Ohio.

GREENVILLE, N. Y.—A local telephone company has been organized at Greenville, with L. P. Roe, president; Alvah Greene, vice-president; L. W. Hallock, secretary, and H. L. Sanford, treasurer. The line is to be run from Greenville to Coxsackie by way of Urlton. Possibly South Waterloo and Norton Hill will be included in the line.

WAVERLY, N. Y.—The council of Waverly has granted Hosea Clark a telephone franchise. The new concern is to be called the Valley Telephone Company.

REMSEN, N. Y.—The Remsen, New York and West Canada Creek Telephone Company is said to have bought the entire interests of the West Canada Telephone Company, whose capital stock is valued at $3,000. The officers of the purchasing company are W. T. Finch, of Northwood, president, and Timothy Dunn, of Remsen, New York, secretary and treasurer.

OHIO.

AKRON, OHIO.—The Akron People's Telephone Company is preparing to cover the entire county with farmers' party lines, giving a $12 rate with a charge of 5 cents for connection with Akron subscribers. Branch exchanges will be established at Tallmadge, Twinsburg, Peninsula, Pomeroy, Macedonia, Liberty, Clinton, Loyal Oak, Sharon and East Liberty.

ARCADIA, OHIO.—The Findlay Home Telephone Company has secured a franchise for an exchange in Arcadia. This exchange will be connected with the Findlay exchange. The work of building lines to Arcadia, Rawson, Vanlue, Benton Ridge and other towns will be commenced early in May.

ASHLAND, OHIO.—The Star Telephone Company has sold its exchange to the Mansfield, Ohio, Telephone Company. The officers of the Mansfield Company, who will run the exchange, are: S. N. Ford, president; John L. Baxter, secretary; M. D. Ward, treasurer.

BOWLING GREEN, OHIO.—The Oil Belt Telephone Company is making arrangements to put in a telephone exchange at Bloomdale, and connect with the long-distance toll lines of the United States Telephone Company here.

DAYTON, OHIO.—The Home Telephone Company of this city again applied to the board for a franchise over city streets. Two applications were received, one from the company, signed by Samuel R. Harshman, president, and the other signed by Albert Emanuel, Esq., and Messrs. Rowe and Shuey, attorneys for the company. The latter set forth that there is a public demand for another telephone system, and that another should be established to prevent a monopoly.

DELTA, OHIO.—The Delta Telephone Company, of Delta, Fulton county, increased its capital stock from $10,000 to $20,000. The stockholders are Bryan Yarnell, J. Pratt, G. R. Whitehouse, George McKay, F. W. Zerman, C. P. P. Waltz and George A. Everett.

EATON, OHIO.—Jonas Markey, William Parker, and C. E. Cox, of Campbellstown, O., are asking for a franchise here.

GARLAND, OHIO.—The Garland Telephone Company has applied to the county commissioners for a franchise granting it the privilege to erect poles and string wires thruout the northern end of the county. The company expects to extend its line from West Milton to Garland.

GENEVA, OHIO.—Geneva telephone plant is to be rebuilt at a cost of about $10,000.

HAMILTON, OHIO.—The Butler Western Telephone Company made application to the county commissioners for a franchise on the Jonathan Smith, or River, road to Venice.

JACOBSBURG, OHIO.—The People's Telephone Company, of Jacobsburg, Belmont county, with $1,000 capital stock.

JOHNSTOWN, OHIO.—The ordinance passed the council granting B. M. Critchfield a franchise to erect and maintain a telephone exchange.

JENERA, OHIO.—Amos A. Geiger has secured a franchise for the Bluffton Telephone Company for twenty-five years.

JACKSON, OHIO.—The Home Telephone Company is anxious to extend its lines to Jackson, and a committee composed of E. Humphries, of Omega, and G. W. Baker and David Nutt, of Beaver, was in Jackson relative to securing a franchise. The company, of which E. Humphries is president, now has wires connecting the following places: Waverly, Piketon, Wakefield, Jasper, Denver, Higby, Richmondale, California, Vigo, and Whitman's, and it is the desire of the company to build from the last-mentioned station to Jackson by way of Cove.

MIDDLETOWN, OHIO.—The Citizens Telephone Company, of Middletown, with $10,000 capital stock, was incorporated.

MIAMISBURG, OHIO.—A meeting of citizens and capitalists who are interested in the or-

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ganization of a home telephone company was held. Judge Fisher and C. F. Brooks of Eaton, and Mr. Zehring, of Germantown, were present. It was decided to continue the present telephone committee, which is composed of Messrs. Allen, Bookwalter and Clark, and appoint two additional members. S. H. Mays and D. W. Young were selected.

NEW PHILADELPHIA, OHIO.—The Tuscarawas Home Telephone Company, New Philadelphia, Ohio, has exchanges at this place, Canal Dover, Uhrichsville, Dennison, New Comerstown and Mineral City, under separate organizations, which, however, will be merged into one company during the next sixty days. There are 464 subscribers in New Philadelphia, the total in all of the towns named being 1,400. Mr. George I. Hoffman, president, states that by December 31 next he expects to have not less than 2,000 subscribers. The company is using American Electric telephone apparatus.

MINERAL CITY, OHIO.—The Exchange Construction Company, of Cleveland, has just completed the new exchange of the Tuscarawas Home Telephone Company, of this city. It starts with 200 subscribers.

RAWSON, OHIO.—The council in the village of Rawson has granted to the Findlay Home Telephone Company, of Findlay, Ohio, a franchise to build a plant in the village.

TOLEDO, OHIO.—Two Independent telephone franchise ordinances are now before the city council. Dr. Watson, acting for the newly organized Toledo Telephone, Telegraph & Messenger Company, and Frank F. Graves, acting for the Toledo Home Telephone Company, are the petitioners. A representative of the Home Telephone Company was on the East Side recently soliciting subscriptions for telephones for his company. The franchise is yet in the hands of a council committee, but the company evidently desires to be in on the ground floor as soon as the franchise is granted.

URBANA, OHIO.—The Urbana Telephone Company is branching out on a line between this city and Mingo, and will be known as the Mingo Valley Telephone Line. The line will go thru Kingscreek, Kennard and Mingo, with an exchange being established at Mingo. The company is considering the advisability of extending the line now to Reynolds to Cable, and establishing an exchange at that place.

VANDALIA, OHIO.—The village council granted the Central Union Telephone Company a franchise this week. An exchange will be located here.

WARREN, OHIO.—Youngstown and Warren men, with abundant means, have subscribed $300,000 to the Independent Telephone Company, whose plant is to be located in Seattle, Washington. Over $100,000 of the amount was taken in this city, where the head of the enterprise is Mr. Jules Vautrot, Jr., one of Warren's most energetic and successful business men. S. B. Claypool, who has been managing the telephone exchange in Birmingham, Alabama, is going to Seattle to manage the new concern. The exchange in Birmingham is largely a Youngstown institution. A. E. Adams, of the Dollar Savings Bank, is the principal stockholder in Youngstown.

UPPER SANDUSKY, OHIO.—C. D. Juvenall, the well-known telephone promoter of this city, has obtained franchises for local exchanges at Jewitt and Scio, Ohio. Independent companies are being organized in these places.

WAUSEON, OHIO.—The Northwestern Ohio Telephone Company has purchased the local telephone exchange and out lines of the Swanton Telephone Company. The company is constructing an exchange at Pettisville and will run a line north of Pettisville; also one from Wauseon to a distance of eight miles southeast. The Northwestern Telephone Company, with headquarters in this city, has increased its capital stock from $20,000 to $40,000. P. J. Lenhart is president and F. J. Spencer secretary.

PENNSYLVANIA.

AMITY, PA.—A telephone company is being formed here, with S. D. Miller, Esq., and H. P. Weaver as principal stockholders.

BURGETTSTOWN, PA.—The West Penn Telephone Company is about to let a contract for the extension of its line from Burgettstown to McDonald, taking in Bulger and Midway. At McDonald the line will connect with the P. & A. lines and allow connection to Pittsburg. The company expects to put in about 100 phones at McDonald. Midway and Bulger will also have a good sized list of subscribers.

CENTRE HILL, PA.—A company has been organized of which Albert W. Preston is president and George W. Wiley secretary. Right of way from Stockton thru Centre Hill secured. An ordinance was introduced granting a telephone franchise to Messrs. F. L. Bills and E. L. Wortham.

DRY RUN, PA.—Citizens of Washington county, Md., and Franklin county, Pa., met at Dry Run and organized a company known as the Dry Run Telephone Company. The object of the company is to build a telephone line from Dry Run to Clearspring, and from there probably to Williamsport and other towns in this county. The following officers were elected: President, Joseph Seibert; vice-president, Joseph Strite; secretary, William E. Troupe; treasurer, Newton Kline.

HARRISBURG, PA.—The Dauphin County Telephone Company has opened an office in the Commonwealth building, under the management of Samuel W. Fitzgerald. The directors and officers of the new company are: President, Hon. B. F. Meyers, Harrisburg; vice-president, Hon. Ward R. Bliss, Delaware county; treasurer, Col. C. A. Lee, Harrisburg; secretary, Charles D. Stucker, Harrisburg; directors, George B. Stucker, John McConkey, Meade D. Detweiler and James Russ, Harrisburg, and W. B. Barnard, Philadelphia; H. C. Young, Columbia, and John Heffelstein, Shamokin.

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HANOVER, PA.—The trustees of the Hanover Telephone Company have sold the franchise and the plant of the company to Samuel L. Johns, of McSherrystown, acting in the interest of T. J. O'Neil, of Hanover, under whose management the business will hereafter be conducted.

KIRKWOOD, PA.—A charter was issued to the Southern Telephone & Telegraph Company, Kirkwood county, capital stock, $10,000.

LEBANON, PA.—The People's Telephone and Telegraph Company, of this city, has sold all its lines to the United Telegraph and Telephone Company, of Philadelphia. The consideration was $75,000. The United Company represents a consolidation of Independent telegraph and telephone companies covering a field from Philadelphia to Williamsport. Its lines extend into Montgomery, Chester, Delaware, Schuykill, Lancaster, Montour, Columbia, Northumberland, Lycoming, York and other counties.

MCDONALD, PA.—The West Penn Telephone Company is about to let a contract for the extension of its line from Burgettstown to McDonald, taking in Bulger and Midway. At McDonald the line will connect with the P. & A. lines and allow connection to Pittsburg. The company expects to put in about 100 'phones at McDonald.

MEADVILLE, PA.—A controlling interest in the stock of the Meadville Telephone Company is now owned by Meadville men. The following officers and directors were elected: Bert G. Hubbell, president and general manager; W. W. Gelvin, vice president; H. M. Dickson, secretary; C. S. Burwell, treasurer, and J. D. Downing and James R. Andrews additional directors.

READING, PA.—Mayor Leader this afternoon signed the ordinance granting street rights to the Schuylkill Valley Telephone Company, which promises to give good service at a greatly reduced figure.

SOLEBURY, PA.—A local telephone company, with Albert Preston, president, and George W. Wiley, secretary, has been formed in Solebury.

WASHINGTON, PA.—At the meeting of the West Penn Telephone Company on Monday, J. B. Painter, of Independence, was retained as superintendent. O. M. Hervey was also elected secretary and C. H. Beall, treasurer. The newly elected directors are O. M. Hervey, C. H. Beall, J. S. Liggett, J. B. Painter, J. E. Perrine, Rev. J. H. Moore and John Anderson.

YORK, PA.—Warren E. Fastnacht of this city, has been awarded the contract to rebuild a twenty-five-mile railroad line for the Perry County Railroad Company.

PEMBERTON, PA.—The recently incorporated Union Telephone Company, of Pemberton, Pa., has been organized to serve the towns of Pemberton, Lewiston, New Egypt and other places in the vicinity. When the line is completed to New Egypt connections will be established there with the Burlington County Telephone Company's lines.

TENNESSEE.

COOKVILLE, TENN.—The Overton Telephone Company has been organized here and will put in a telephone exchange to compete with the Gainesboro. Telephone Company, which owns the only lines here now. It has got up a merry fight and telephones will be cheap. The new company will spend $10,000 in putting up its line.

GAINESBORO, TENN.—There is a new telephone company being organized at this place. It is understood that Dr. S. B. Fowler, R. V. Brooks, president of the First National Bank of this place; L. S. Anderson, W. I. Kitterel, D. J. Shepherd, of Granville, and several other prominent men of this county, in connection with the Overton Telephone Company, of Overton and Pickett counties, will compose the company. Poles are being placed for a line to Carthage and Cookville, and other lines will be built as fast as possible.

HARRIMAN, TENN.—The Citizens Mutual Telephone Company was granted a franchise. Capital already subscribed, $4,000. F. H. Burt is the active promoter.

KNOXVILLE, TENN.—The charter of the Southern Telephone and Construction Company was filed. The incorporators are: W. Oliver Rhode, Walter S. Roberts, Joseph W. Sneed, Germain Kern and J. Cleveland Harris. The capital stock is to be $10,000. W. O. Rhode is president, W. S. Roberts, vice-president, and C. L. Myers, general manager.

LAFAYETTE, TENN.—Issued a charter to the Union Telephone Company, of Lafayette, Macon county, incorporated with a capital stock of $5,000, by H. C. Smith, H. N. Donoho, John B. Dalton, A. W. Wakefield, E. K. Lamb, L. L. Simmons and W. H. Carter.

MEMPHIS, TENN.—Council granted permission to the new Memphis Telephone Company to begin the construction of its telephone plant. The rates fixed in the contract between the city and the company are $48 per annum for business 'phones and $36 per annum for residence 'phones. The system used will be what is known as the automatic central energy, or common battery. The cost of thus equipping and constructing the exchange will approximate $500,000. Negotiations are pending with the Postal Telegraph Company which will probably result in that company using the same conduits with the Memphis Telephone Company. Among the well-known Memphians interested in the enterprise are Messrs. W. A. Percy. G. B. Galloway, T. J. Hunt, Leon Hunt, Bolton Smith, T. K. Riddick. James S. Warren is general manager, Frank C. Smith chief engineer.

NEW DECATUR, TENN.—Judge William E. Skeggs and Col. Samuel Blackwell are organizing the Commercial Telephone Company with a capital stock of $10,000.

TEXAS.

BEAUMONT, TEX.—Lawrence Harrison, T. C. King and S. E. Chapan have incorporated the Southwestern Telephone Company, with a capital stock of $50,000.

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BRENHAM, TEX.—Direct telephone connection between Brenham and Caldwell is established by the completion of the Trans-Telephone Company's lines to that place. The line will be carried north as far as Milano as soon as possible, and will be extended south from Brenham. W. N. Mayfield, of this city, will put in an exchange at Somerville, and probably at Caldwell.

DAVILLA, TEX.—The Davilla Telephone & Improvement Company—to construct and operate a telephone system in Milam, Bell and Williamson counties. Capital stock, $10,000. Incorporators: J. C. Cronk, Robert P. Kerr, E. H. White and others.

PRESTON, TEX.—Charter issued to the Preston Bend Telephone Company, of Preston. The capital stock is $5,000. The incorporators are: A. G. Noble, J. Hamp Willis, R. A. Owen and J. T. Watkins.

SEYMOUR, TEX.—The Proffitt Telegraph & Telephone Company, of Seymour, Baylor county. Capital stock, $10,000. Incorporated by: J. W. Proffitt, of Proffitt, Texas; J. H. Glasgow and G. G. Garrett, of Seymour.

LAFAYETTE, TEX.—The Union Telephone Company has been incorporated, with capital stock of $5,000, by H. C. Smith, H. N. Donoho, John B. Dalton and others.

JACKSBORO, TEX.—The Jacksboro, Post Oak, Shannon, Antelope, Windthrost & Archer City Telephone Line, of Texas, was completed to the first-named place recently and connected with the lines of the Southwestern Telegraph & Telephone Company. When entirely complete the line will be seventy miles in length.

WISCONSIN.

BOYD, WIS.—The O. J. Jenson Telephone Company, of Cadott, which owns and operates a telephone system from Cadott to Estella, in this county, has been granted franchises to place exchanges at Boyd and Stanley.

BARABOO, WIS.—The Badger Long Distance Telephone Company, of Baraboo, capital, $100,000, with A. C. Gray as president and Frank T. Brewster as secretary, has been incorporated by Frank T. Webster, William H. Hatch and Frank A. Philbrick.

BOSCOBEL, WIS.—The Farmers' Telephone Company at a recent meeting perfected organization, electing the following permanent officers: President, J. J. Ruka; secretary, F. B. Sarles; treasurer, B. T. Williams; superintendent, Richard Walker. This company will put in a 100-drop board and erect a direct line between this city and Fennimore.

BEAVER DAM, WIS.—The People's Telephone Company, which owns exchanges at Rio, Wyocena, Cambria, Randolph and Fox Lake, contemplates establishing exchanges at Beaver Dam and Juneau.

CATO, WIS.—The Manitowoc and Western Telephone Company held its annual meeting at Cato, Wis. The following were elected: President, George Wittman; vice-president, Frank Shaffer; treasurer, W. N. Killen; general manager, J. P. Watt; secretary, T. H. Meany.

COLUMBUS, WIS.—Messrs. H. E. Kepler and Charles Schernecker, of Sun Prairie, Wis., are asking a franchise at Columbus.

GRAND RAPIDS, WIS.—The Wood County Telephone Line Company has purchased the Vesper line and will keep it in operation for the benefit of the farmers along the right of way.

MILWAUKEE, WIS.—The Badger State Long Distance Telephone Company, which recently selected Milwaukee as its headquarters, filed amendments to its articles of incorporation. It has a capital stock of $100,000. A. C. Gray is president and R. M. Richmond secretary, the incorporators being F. T. Brewster, W. H. Hatch and F. A. Philbrick.

OAKFIELD, WIS.—Articles of incorporation of the Oakfield Telephone Company have been filed. The capital stock is fixed at $4,000 and divided into shares of $100 each. Dr. E. J. Orvis, of Oakfield, is president; W. E. Bristol, secretary, and Dr. C. H. Moore, treasurer.

RIPON, WIS.—At the annual meeting of the Ripon Telephone Company the following were elected: T. S. Chittenden, president; S. M. Pedrick, secretary; H. P. Cody, treasurer.

VIOLA, WIS.—Telephone ordinance granted to N. H. Burgor.

VERONA, WIS.—Another telephone line is proposed from Verona to Mt. Vernon. John A. Miller heads the movement.

LA CROSSE, WIS.—La Crosse is to have direct communication with Milwaukee over the wires of the Independent Telephone Companies between this city and the metropolis. The first step to bring about this gigantic scheme was taken a few days ago when the Badger Long Distance Telephone Company was organized at Baraboo with a capital of $100,000. The officers of the company are: A. C. Gray, president; Frank T. Brewster, secretary. The incorporators are Frank Webswer, William Hatch and Frank A. Philbrick. The plan which has been practically settled upon is as follows: The La Crosse Independent Telephone Company, whose wires extend from this city to Sparta, will connect with the company, whose wires run from Sparta to Wonewoc. Another connection will be made from that place to Baraboo and thence into Madison. The Independent company of the capital city will then carry the message from there to Milwaukee over its wires. In that way La Crosse will come in direct communication with Milwaukee over the wires of Independent companies. The same plan will be followed from this city to Minneapolis.

OTHER STATES.

BISHOPVILLE, S. C.—A commission was issud to the Bishopville Telephone Company, of Bishopville, which proposes to operate telephone lines in the counties of Sumter, Darlington and Kershaw. The capital stock is to be $5,000. The incorporators are W. S. Smith, of Smithville; Nat. Barrett, of Mann ville, and J. E. McLure, of Bishopville.

GAFFNEY, S. C.—The Gaffney Telephone

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Company has permanently organized and will construct a complete system of 150 instruments.

CHARLOTTE, N. C.—The Queen City Telephone Company's plant, which some time ago went into the hands of a receiver, has been sold to James M. Curtis, an attorney at law of 71 Wall street, New York city, for $23,000. The plant was sold by order of court to satisfy indebtedness to the amount of about $30,000.

AUSTELL, GA.—The Austell Telephone Company was granted a charter. The incorporators are A. H. Irwin, F. W. Runyan, W. B. Westmoreland, of this county, and J. H. Lauch, B. H. Veal and R. B. Claud, of Douglass county. An exchange will soon be placed in Austell and lines run from there to Atlanta, Marietta, Powder Springs, Lythia Springs and other places.

DUBLIN, GA.—Clark Grier, manager of the Macon & Dublin Telephone Company, has petitioned the city for authority to establish an exchange in Dublin.

CUMBERLAND, W. VA.—The Woodford Telephone Company, a West Virginia corporation with its main offices at Elkins, has applied to the Cumberland city council for a franchise to put in a system. They agree to limit the charges to $18 for residence and $24 for business 'phones, and to extend the system at once to all Georges Creek towns and up the West Virginia Central, and later to give thru connection with Baltimore, Washington, Pittsburg, Wheeling and Philadelphia.

BACK CREEK VALLEY, VA.—A stock company is soon to be formed in Back Creek Valley, Va., for the purpose of building an Independent telephone line, which will connect at Martinsburg with the Winchester system.

SKAGUAY, ALASKA.—The Alaska General Electric Company has an exchange of 110-drop capacity and uses apparatus of the American Electric Telephone Company. It has 103 subscribers at the present time, fifty of whom were added during the past year. The company has been in operation only thirteen months. It expects to start two more exchanges, one of 100-drop capacity at Juneau, and one of about fifty drops at Valdese. It will also complete a toll line during the next summer to connect Skaguay with Hains' Mission at Porcupine, about seventy-five miles distant. E. O. Caswell is the manager of the company.

GARDNER, KAN.—Incorporated: The Gardner Telephone Company, Gardner, Kan. Capital stock, $5,000.

HALSTEAD, KAN.—Manager Champlin, of the Newton telephone exchange, has worked up enough telephone subscribers at Halstead and will put in a plant at that place.

CARLISLE, ARK.—E. A. Wilson and others have organized an Independent telephone company for construction of a system.

SPIRO, ARK.—J. B. Breedlove has been granted a franchise to operate a telephone line at Spiro.

DURANT, I. T.—The Denison and Choctaw Telephone Company has sold its line and exchange here to Captain Hughes, of Bonham.

NEZ PERCE, IDAHO.—The directors of the Nez Perce Telephone Company met and completed organization. W. J. Ramey was elected president.

LAKE VIEW, ORE.—The proposed Lake County Telephone and Telegraph System is assured. The capital stock of $5,000 has been subscribed. The line will connect Lake View and Silver Lake.

RIVERTON, N. J.—The borough council of Riverton granted a franchise last night to the Burlington County Telephone Company.

WORCESTER, MASS.—The directors of the Citizens Telephone Company will probably ask for another franchise. The one granted last year contained some conditions which were not entirely satisfactory.

FITCHBURG, MASS.—The Fitchburg and Leominster Telephone Company, with exchange offices in Fitchburg and Leominster, has been organized. The incorporators are Samuel L. Graves, Henry A. Goodrich, Emmons Crocker, Milton L. Cushing, Alexander S. Paton, Edward F. Blodgett, Thomas H. Shea, Henry Allison and George R. Damon.

NORTHVILLE, MICH.—The Northville Independent Telephone Company has secured the right to string wires on the Detroit and Northwestern Electric Railway Company's poles to Farmington and Pontiac, and on the Detroit, Plymouth and Northville Company's poles to Plymouth, and from there the Plymouth Independent company continues on to Wayne, where connection will be made with the Independent line running to New Boston, Romulus, Willow, Waltz, Carleton, Flat Rock and Rockwood.

HUNTINGTON, W. VA.—The recently incorporated Wyandotte Valley, W. Va., Telephone Company, of Huntington, is engaged in the construction of telephone systems, and Mr. T. S. Scanlon is in charge of the work. The capital stock of the company is reported at $5,000, with the privilege of increasing to $25,000. The incorporators, besides Mr. Scanlon, are R. L. Archer, J. W. Hambrick, C. B. Campbell and George I. Neal.

WICHITA, KAN.—A. R. Champlain, of New ton, Kan., recently appeared before the city council of Wichita and asked it to pass an ordinance granting him permission to operate a long-distance telephone line in that city.

NEW DECATUR, ALA.—Papers have recently been filed at New Decatur, Ala., for the incorporation of a new telephone company, which will operate in both of the Decaturs, with a capital of $10,000.

THE American Electric Fuse Company furnishes a little book of information on fuses, and it is worth the place of a space on the front shelf in any telephone man's library. They will be pleased to send this little book upon request.

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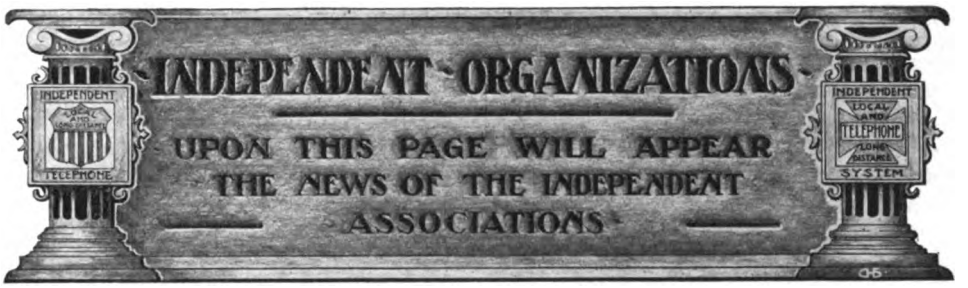

IOWA INDEPENDENT TELEPHONE ASSOCIATION.

The fifth annual meeting of the Iowa Independent Telephone Association convened at the Savery Tuesday, March 12. J. S. Bellamy, of Knoxville, is president of the association; H. C. Raney, of Fairfield, is vice-president, and Charles C. Deering, of Boone, is secretary.

President Bellamy called the meeting to order, and the following Committee on Credentials was appointed: George N. Bandy, of Perry; Charles Kirk, of Chariton, and U. S. Alderman, of Nevada. Treasurer Deering reported that the finances of the organization were in good condition.

President Bellamy then delivered his annual address, which follows:

"I desire to congratulate the Independent telephone interests on the measure of success that has been obtained during the past year. Many new fields have been occupied since our last meeting, and those that were in business have generally been prosperous, adding to the systems much new business.

"The courts have decided against the claims of the Bell Company on the Berliner patents relating to transmitters, thus giving confidence to Independent interests that they will at least have a clear field and can compete for business on equal terms with the Bell Company.

"The incentive of the Independent companies to make terms with the Bell Company in order to avoid suits for infringement should no longer be considered.

"I desire to briefly call your attention to a few of the many important matters that, in my judgment, should be considered by the convention. I do not care to enter into a discussion of the different questions at length, as others more able than I will discuss the subjects fully, but will content myself with a mere mention.

"The farmer line is now a live question with most exchange managers. That the prosperous Iowa farmer is determined to enjoy the benefits of telephone connection with the city exchange is, in my judgment, a settled fact. The question of how this can be best obtained is what we must decide. The town exchange needs this business and the farmer desires the connection. That the exchange owner can build and operate the farmer's line cheaper and give better service than farmers if they build their own lines and undertake to operate them on their own responsibility, I fully believe to be a fact. A fixed rule to govern all cases can not be made by this association, but some plan — to be used as a guide — that would be fair to all parties should be adopted.

"The subject of long-distance toll lines should be most thoroly discussed. If we continue in the telephone business we must have long-distance connections. I do not believe the building of these lines should be undertaken by the local exchanges, but by some company that would make this their business, leaving the local exchange to take care of the toll, beginning and ending in the counties, and possibly the exchanges of toll that begin and end in counties contiguous to each other, leaving business that passes over two or more counties and the business between the larger cities to be taken care of by the long-distance company. The local company could furnish pin room for these lines and either take stock in a long-distance com-

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pany, as their pay, or receive a reasonable rent.

"How to keep the accounts and divide the toll business between companies exchanging business with each other has been discussed at our former meetings and doubtless will occupy a good share of the time at this. I believe a special committee was appointed at the last meeting to consider this question. In their report they will doubtless be able to suggest a more satisfactory plan than the one now in use.

H. C. Raney, of Fairfield, read a paper entitled "Government Ownership of Telephone Lines."

A. N. Presson, of Iowa City, read a paper on "Our Greatest Need — Thru Copper Lines."

"Farmers' Lines and Our Experience with Them." C. L. Dobie, Sigourney.

"Future of the Farm-line Movement." George N. Bandy, Perry.

"The Telephone Business Looked at as an Investment." U. S. Alderman, Nevada.

"Report of the Last Meeting of the United States Telephone Association." W. H. Durin, Cedar Rapids.

"Review of the Past Year's Work." C. M. McFatridge, Moravia.

"A Clearing-house for Monthly Reports and Settlement of Toll Business." C. F. Bennett, Waterloo.

"Underground Construction." O. H. Gray, Des Moines.

"Central Energy." C. W. Stiger, Chicago.

Election of officers. New business.

Following are the companies in good standing and their representatives at the convention, as reported by the Committee on Credentials:

Mutual Telephone Company, Des Moines. O. H. Getty.

Jasper County Telephone Company.

Marshall Telephone Company.

Knoxville Electric Company. J. S. Bellamy.

Boone County Telephone Company. Charles Deering.

Ottumwa Telephone Company. H. E. Pancost.

Johnson County Telephone Company. A. N. Presson.

Hawkeye Telephone Company, Perry. George N. Bandy, O. A. Knell, E. A. LeVan.

Johnson County Mutual Telephone Company. Edwin Hummer.

Thurman Telephone Company. H. McCartney.

Illinois Electric Company. W. McNeill, Jr.

State Center Telephone Company. Theo. T. Sweip.

Nevada Mutual Telephone Company. U. S. Alderman.

Fort Dodge Telephone Company. Joseph M. Plaister.

Electric Appliance Company. S. A. Dinsmore.

Union Mutual Telephone Company. H. C. Chapin, A. L. Wood.

Hawkeye Telephone Company. N. Simison.

Nodaway Telephone Company. Edwin Henshaw.

Musson Brothers, Atlantic. F. C. Musson.

Jefferson County Telephone Company. H. C. Raney.

Madrid Telephone Company. J. A. Anderson.

Chariton Telephone Company. J. C. Sullivan, George A. Atkinson.

Central Telephone Company, Creston. E. Atkinson.

People's Telephone Company, Rockwell City. J. H. Bracel.

Central Telephone Company, Des Moines. McFarlin and Hill.

MEETING OF THE INDEPENDENT COMPANIES OF OHIO.

A meeting of the Independent telephone companies of Ohio will be held at the Chittenden Hotel, Columbus, April 5. The call is the result of a conference which was held at Cleveland, and is signed by Judge James M. Thomas as president of the State association, and H. D. Critchfield as secretary.

The purpose of the meeting as set forth in the circular is to consider matters which will result in a more harmonious coöperation of the Independent companies. It is expected that each of the 180 companies in Ohio will send a representative to the meeting.

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HELLO GIRLS DENOUNCE CORKSCREW CURLS.

Chicago telephone girls demand the solution of one of the most tangled legal problems ever presented. They want to know whether it is not an invasion of constitutional rights for a corporation to restrict the fashion of women employes' coiffures. According to such judicial authorities as they have thus far consulted, they have ample grounds for the institution of proceedings which should either lend kinks to their hair or smooth the tangles out of their quandary.

The pith of the telephone girls' complaint is contained in their assertion that the company requires them to arrange their hair in corkscrew curls, hugging the sides of their heads, in the good old fashion much affected by their grandmothers, but which the young women assert tend to impart an "old-maidish look." This complaint is not of recent origin. It is companion to the indignation evoked long ago by the company's requirement that all its girl employes attire themselves, during working hours, in simple dresses of severe black.

But the recent order, directing that all the girls be vaccinated on their legs, evoked a flood of tears and petulant protests, reviving all the grievances of the past which now emerge from their moribund state to be paraded with the latest complaint. Of course, the telephone company's executive officers have abundant explanation for each of the orders against which the girls complain. "They are necessary," these officers say, "to facilitate our service thru the maintenance of discipline and attentiveness to duty."

The aggrieved young women, however, find in each of these requirements an assault on their happiness in so far as it curtails their opportunities for social pleasures. "That vaccination order," said one of the girls in the group at Washington and Franklin streets yesterday afternoon, "has resulted in keeping most of us away from parties and dances and other good times, and just before Lent, too. It seems to me that the people of this great republic"—and here the speaker's eyes flashed indignantly while her bosom heaved with emotion—"should at least be granted the privilege of arranging their hair as they choose. And I imagine the subscribers of the company can get as good service from the girls even if their hair does hang down their backs instead of being done up in corkscrew curls."

ELECTRIC RAILWAY TELEPHONE SYSTEM.

The Michigan Traction Company has established a telephone system along the route of the Battle Creek-Kalamazoo Electric Railway and now the conductors can communicate with headquarters from several points between stations. Between Battle Creek and Kalamazoo a number of boxes are affixed to the guy-poles of the electric-wiring system of the road and all a car conductor has to do to secure communication with the main offices is to alight from the coach, connect a small telephonic instrument with an apparatus inclosed in the box, ring up the place he wants to get, and talk. The transmission of the voice is of remarkable clearness and is far in advance in excellence of the telephone systems in either Battle Creek or Kalamazoo.

LINEMEN ORGANIZE.

The linemen of the telephone companies at Lexington, Ky., have perfected an organization to be a branch of the International Brotherhood of Electrical Workers. They will ask for a charter.

NO CHECK STAMPS AFTER JULY 1.

The Government has repealed the tax on checks, certificates of deposit, notes, money orders, bills of lading, express receipts, telephone messages, bonds, conveyances, telegrams, life insurance leases, mortgages, passage tickets and warehouse receipts. The modifications of the law go into effect in nearly all cases on July 1.

"Your TELEPHONE MAGAZINE is very instructive along that line of work. Do not see how I can get along without it." H. W. R.

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WANTED,

WANT ADS.

Which will appear on this page under the heading "WANTS." They will be classified under the following heads:

HELP WANTED,
SITUATIONS WANTED,
STOCK WANTED,
CAPITAL WANTED,
EXCHANGES FOR SALE,
MATERIAL FOR SALE and
MISCELLANEOUS WANTS.

The rate under these headings will be seven cents per word.

POSITION WANTED—Capable telephone man wishes position with independent company. Now with Bell Company.
Address A-12, Telephone Magazine.

POSITION WANTED—As inspector or manager of telephone exchange; experienced in all branches of telephony. Sober, industrious. Can give references. Permanent position desired at moderate wages.
Address A-13, Telephone Magazine.

FOR SALE—300 Standard 4-Pin Cross-Arms, including Pins, 10 cents each; 500 heavy Glass Insulators, 1 cent each; a small quantity Oak Brackets, 1 cent each.
Address A-14, Telephone Magazine.

POSITION WANTED—With telephone company where strict attention to business will procure advancement. Technical education. Good references.
Address A-9, Telephone Magazine.

POSITION WANTED—By a young man with nine years' experience as lineman; can do all-around work. Sober and not afraid of work. Best of references.
Address A-10, Telephone Magazine.

POSITION WANTED—Superintendent or manager of independent company. Ten years' experience with magneto and common battery system. Married. Strictly temperate and a hustler. At present with Bell Company.
Address A-11, Telephone Magazine.

BOUND VOLUMES

Vol. XV. January-June, 1900,

OF THE

Telephone Magazine

Substantially bound in Muslin, with Gilt Title, will be sent, postpaid, for $1.50 per volume to any address.

Electrical Engineering Publishing Co.
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Telephone Magazine

VOL. XVII. CHICAGO, MAY, 1901. No. 116.

SOME REMINISCENCES OF EARLY TELEPHONE DAYS IN BOSTON.

In 1879 the number of men who knew enough about practical electric work to run a small covered wire along walls and across ceilings, and to connect up instruments, was small; hence it happened that the writer, then a very young man and living in New York city, was offered a position, without previous interview, in the Boston telephone exchange, which at that time occupied one small corner of the third floor of a building on Washington street, near Milk. His duties were to be those of an inside wire man, and to make himself generally useful as needed.

The exchange consisted of a shelf,

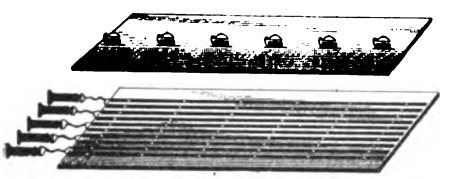

FIG. 1.

containing a line of tap bells, perhaps eight in all, each one on a grounded circuit with from four to six subscribers. Directly underneath each of these bells there was a spring jack, and on a narrow table, still lower down, there were half a dozen pairs of brass strips with plug holes, each pair with a "listening" telephone looped in (Fig. 1).

Each subscriber had his own signal number, and could, by means of his push-button, call up any one else on the same line. I can not recall the office signal, but in practice the subscriber would pound his push-button and keep at it until his bell failed to ring, which meant, or was supposed to mean, that the central office was ready and waiting, tho very often some curious subscriber would cut in to see what it was all about, in which case there usually were some very hard words.

The central office answered calls; that is, the single boy operator did, by inserting a plug into the jack under the proper bell, and then yelling thru his hand telephone "Hello!" following this up by dexterously transferring the instrument from his mouth to his ear. The subscriber, meantime, having

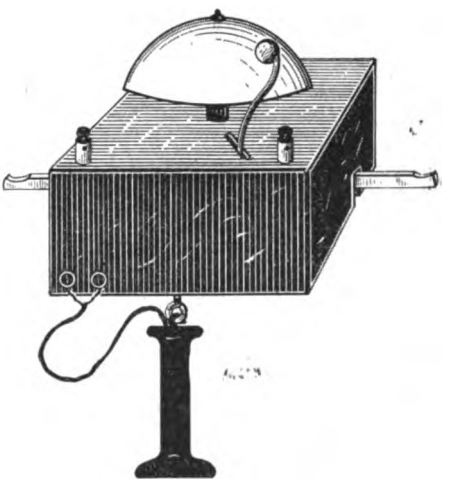

FIG. 2.

thrown over his talking switch, which he often forgot to replace, would answer back in the same way. Before stating what he wanted he would first make sure that he was really talking to central, a very essential point, and then would give his order, thru the hand telephone of course, yelling at the top of his voice. The operator, to get the party wanted, would then call by signal, usually causing two or three curious ones to cut in and ask: "Were you calling me?"

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To make a connection the operator would put the two lines together, by means of single cords and plugs, to a pair of strips, and tell the small boy at the end of the table to start them; which he did by calling each one in turn thru his listening hand telephone. If one of the parties, tired of waiting, would go away from his instrument, then the operator would have to call him up again, meantime perhaps losing the other. Each connection made was a triumph for the system. One of the duties of the small boy at the end of the switchboard was to watch the conversation, by means of the looped-in hand telephones, and when on any of the circuits he could not hear voices, he would give a loud "hello" to make sure the wire was not being held, and then order the disconnection. Quite often he was careless, however, and did not comply with all the formalities, much to the wrath of the subscribers.

The operating department, which, disregarding the small boy, who did not count, had, of course, to go to dinner sometimes, and hence it was necessary to have a relief clerk, tho in the earliest days of the exchange, this matter was for a time arranged by shutting down entirely during the noon hour. Anybody handy served as this relief clerk; and even the general manager, who, by the way, was the whole executive staff, would occasionally serve a turn.

In some of the subscribers' stations were "box" telephones (Fig. 3), which were large editions of the hand telephones, with the diaphragm placed at right angles to the ends of an extra large and powerful horseshoe magnet. This instrument, about the size of a schoolboy's lunch box, gave out a loud sound, but so indistinct that the subscribers, after a few trials, declined to use it any more.

It is surprising how well speech carried in those days, even tho hand telephones alone were used. There were no electro-dynamic currents at all; neither trolley, electric light nor anything else. The only disturbance, aside from the cross-talk, of which there was a superfluity, was that which arose from the Postal Telegraph's rapid system of transmitting press reports to New York. The machine which they used for the purpose caused every telephone in the city to give out a peculiar sing-song note, that sounded ludicrous, but after all produced little serious inconvenience.

While it is true that the subscribers had to communicate at the top of their voices, so that in some cases, when in the same neighborhood, they might readily have heard one another without using the telephone at all, still the enunciation was very clear. This is not the case under present conditions. A short time ago the central office here in Chicago failed for some reason to supply a current to the line, thereby

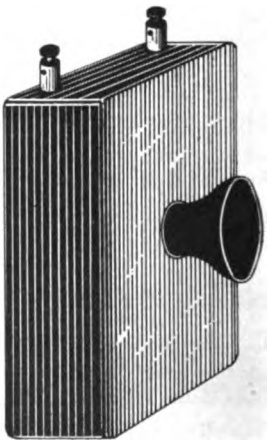

FIG. 3.

inutilizing the transmitter. I tried to use the receiver as a transmitter, but without success. Naturally, between cables and condensers, this would be too much to ask, but in the old days it was not difficult, especially when the lungs were in good condition.

In Cambridge, on the opposite side of the Charles river from Boston proper, the system used was somewhat different. There were no signal bells at subscribers' stations, simply a single hand telephone looped in with sometimes as high as fifteen or twenty subscribers on a line. There could be no intercommunication, but central could be called by depressing a key, thereby putting a primary battery current on the line For the cen-

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tral to call up a subscriber, an induction coil was switched in and out of circuit by means of a suitable handle, and this caused all the telephones on the given line to emit a series of high-pitched, squeaky sounds, which could be heard all over the entire house. The residence portion of Cambridge was very quiet and there were no stores in the system, and this made the method a satisfactory one under the circumstances.

All the circuits in those days were grounded, usually on gas pipes, without soldering, of course, that method, at the time, being an unused art. Any kind of splice was thought good enough. Sometimes the pipe would not be connected with a meter; then another would have to be found, and if strictly necessary a water-pipe would be used. Sometimes in a large building where there would be more than one subscriber, the ground would be so poor, due probably to the white-leaded joints, that a special wire would be run to the street side of the meter, something that was looked upon as quite an engineering feat. I remember one case where two private lines were all mixed up, tho they were some blocks apart. Probably there was a conducting vein of earth between the two, but whether so or not, the riddle was unsolvable, and the instruments were finally ordered out.

Fig. 4 shows the first Williams board as I remember it. The line of diagrammatic squares at the top are annunciator drops, with corresponding jack holes immediately beneath. Below are brass connecting strips, each one serving for one connection. To cut in and listen, the operator would insert his plug between the plug of the cord used to make connection with the bars and the upper spring of the jack. Single cords were used for the connections.

All outside wires were housetop, and while there was little or no system in their arrangement, still for a long time there was no difficulty in stringing them, since there was a popular belief that the wires protected the houses from lightning.

Those were pleasant days for the men. Whenever the outside wire was brought to the window, or the inside man came

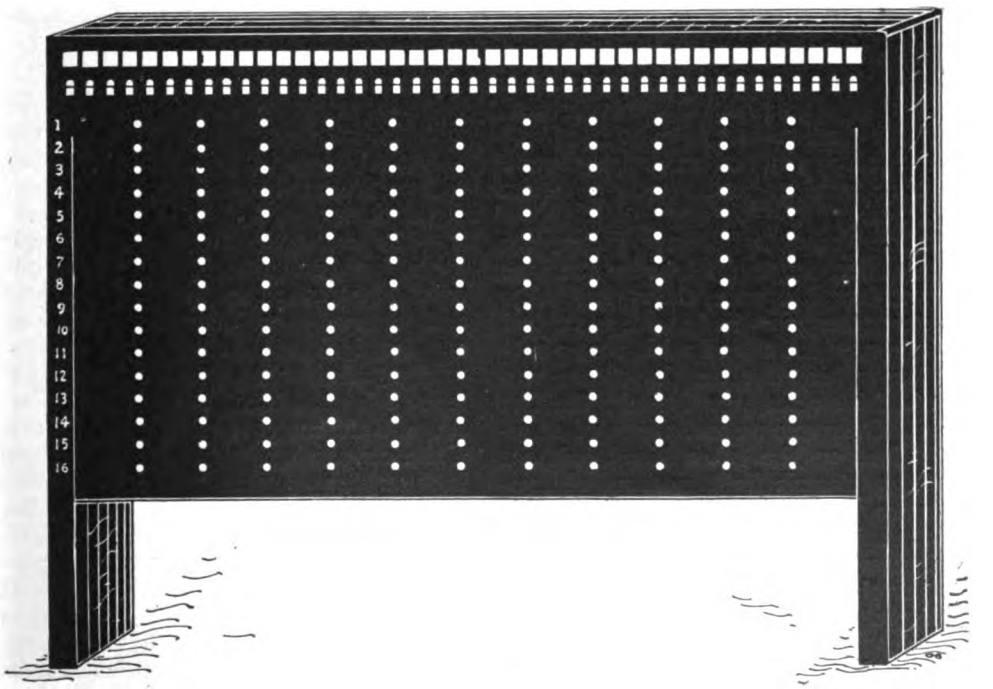

FIG. 4.

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to place the instrument, he was always well treated, sometimes even a dinner with the proprietor, probably as a sort of curiosity; but this soon changed, just as soon as the company began to raise its rates. At first the price was $3 per month, tho in the opposition company, the Edison, they were higher. This latter company was using the Edison carbon transmitter, and therefore giving a better service. Indeed, for some time it looked very much as if it would control the field, tho in a few months it went out of business, as the result of an arrangement between the American Bell and the Western Union. While the competition lasted, however, there was much feeling on both sides.

In the central office at this time there was one lone, solitary Blake transmitter, which was really on trial, tho incidentally it took part in several telephone social functions. It was arranged on a post near the switchboard, and was just at the right height so that Will L., when sitting upon a stool in front of it, could bring his banjo into the very best position for a concert. Very often of an evening a batch of subscribers would be called up and notified that the performance was about to begin. These amateur entertainments were always popular, often lasting until the sole performer was exhausted, and had the approval of the management, as they were supposed to be good for business.

It was remarkable how distinct the enunciation of the Blake transmitter was at that time, when the various other electric enterprises had not been started. I have met and talked with a new subscriber in his office, and later have recognized his voice over the wire the first time. Of course we had plenty of cross-talk, but on the other hand, without trolleys, electric light systems, electro-dynamo plants, cables, and with most of the subscribers at short distances, we did get much greater clearness of enunciation than is now the case. I can not help but admire the high-grade telephonic instruments of today, tho under the best conditions the sound comes somewhat thick, and often close attention is necessary in order to avoid misunderstandings, especially in regard to numbers.

The experiments made with the Blake transmitter were so satisfactory that in a few months they began to go in very rapidly, followed in a short time by the magneto and two party lines, with increased rates, of course, and did not please the public.

By this time the little corner on the third floor had become altogether inadequate, and the top floor of the same building was leased and fitted up as an operating room, tho it seemed to be altogether too large for the purpose. The first switchboards put in were of the Williams style, and in this we saw for the first time the annunciator drop applied to telephone work. To work the system, the operators, now increased

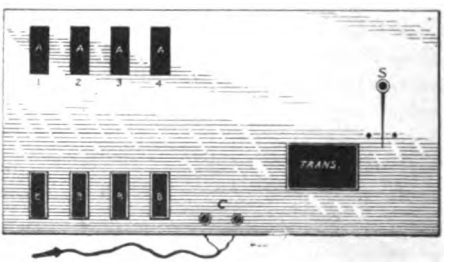

FIG. 5.

to three, made use of a hand telephone with attached cords and plug, which they would insert into the line, and then communicate with the subscriber, shouting at the top of their voices, then making the connection with short single cords, both drops being left in the circuit. The method was a very noisy one, and passers-by would sometimes look up inquiringly from the street.

Fig. 5 shows the top of the girl operator's table used later. A represents four drops, B the corresponding spring jacks, C the connecting jack and cords to cut in the table apparatus, S a spring switch permitting the use of either the talking or ringing apparatus. There was also another switch, not shown, which permitted the operator to cut in the hand telephone alone in order that she might watch the conversation without the subscribers' knowledge.

About this time the exchange began

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to keep open night and day, and the writer was ordered to sleep in the operating room and get up to answer calls if any should come in. This lasted only a week, when he went on strike all by himself, with the result that a regular night clerk was appointed, who was directed to stay awake, tho to make sure, local attachments were arranged, so that any drop falling would set off an alarm bell. The operator did go to sleep after all, however, so that complaints began to come in, hence a much larger bell was attached, and a lot of the boys on their own responsibility ran a batch of wires from behind the switchboard to the floor below, where they attached them to a clock in such a way that between midnight and six in the morning

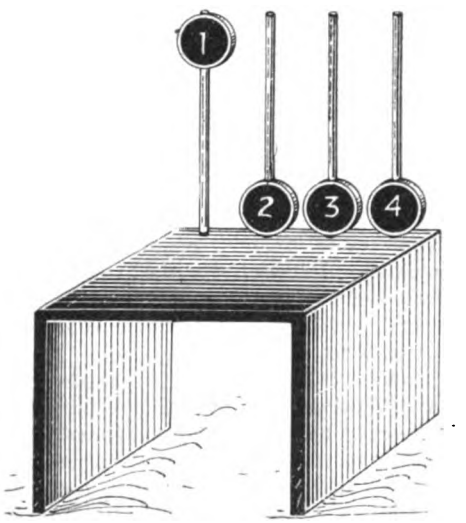

FIG. 6.

a different drop would fall every five minutes, thus effectually keeping the night man awake. However, he was very conscientious in the performance of his duty, and hence called the subscribers out of their bed each time to ask them what they wanted, and this naturally led to some very vigorous complaints, which, reaching the boys' ears, they removed their trick wires in a hurry.

Fig. 6 shows the disks used on operator's tables to show how many of her lines were in use. The disk elevated meant that the line was free. This information was meant, of course, for the switch boys.

As the number of subscribers grew larger, more boards were connected up, more boys were hired, more calls came in, and there was more shouting into the receivers at the switchboard, until the result was pandemonium.

To correct this several sewing-machine tables were arranged, each with four drops and connected with four strips on the switchboard, and each in charge of a girl. By this method the switch boys were reduced to two. When a drop would fall, they would connect the line with some vacant table, where the girl would ask what was wanted and then by a messenger and a slip of paper would send an order to the switchboard calling for the line wanted. Getting this, she would then make the connection, watch it, see it thru, and at last order it off.

This method put an end to the noise, and for a while was satisfactory, but the number of subscribers was growing fast and the system soon proved too slow. To improve it, signal disks were put on all the tables, and two clerks were appointed, one to watch the board, to see that no lines were left open thru cords accidentally pulled out, and the other to march up and down the room and see that for all table drops not in use the proper signal disk should be in sight, thereby showing the switch boys to which table to plug the coils.

This method relieved the trouble for a while, but the continually increasing calls soon gave us more than we could do and the system became very bad. I remember one Christmas Eve all the force turned into the operating room, much to the delight of the girls, to help. The tables were soon full, then we began to keep a record of the waiting calls on a slate; but this filled up so fast that we adopted the method of rubbing it out and then making a fresh start, a system which, needless to say, we never explained to visitors.

Branch offices were now started with a connecting trunk line; just one, and for a while matters went smoothly, but the steadily increasing calls soon made it necessary to build new trunk lines

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and in this the company held off on account of the expense, so that very soon there was another snarl of work, tho this time with a great howl from the public, who were not at all pleased with another increase in rates.

Finally there came a reorganization. A new and spacious building was taken, with an operating room large enough, as we thought at the time, to last twenty years. A large force of men was put on, Gilliland switchboards were put up, and the exchange from that time on was strictly a business, as it has ever been since. Before this change, as one of the boys expressed it, it was a place to have fun.

During all this time the work of stretching lines to the adjacent towns had been going on, but with so much "fish frying" on the wires that the boys decided among themselves that the attempt to have long-distance telephony was a failure, in which, of course, they were entirely wrong.

R. M. LOCKWOOD.

J. B. WARE GOES TO DETROIT.

Joseph B. Ware, president of the Michigan Telephone Association, having made a success of the Grand Rapids, Mich., Independent Telephone Exchange, goes to Detroit to manage the new Independent company in that city. He has presented his resignation as secretary to the board of directors of the Citizens' Telephone Company, which was accepted, and he was immediately elected to the position of director made vacant by the appointment of E. B. Fisher as secretary. The formal action of the board at what was the regular monthly meeting makes it possible for Mr. Ware to accept the position offered him by the People's Telephone Company of Detroit, a new Independent company, as general manager, and at the same time remain an active official and stockholder in the local company, for which he has done so much.

Besides the kindly words spoken by the directors in connection with Mr. Ware's resignation, to take charge of the Detroit exchange, a formal action was taken, led by Judge Cyrus E. Perkins.

A MYSTERY OF PARIS.

Gabriel Leroux, ex-prefect of the Rhone Department, of the city of Paris, France, killed himself.

Tho only forty-six years old, he had held many important public posts. Several months ago he was removed from the position of prefect of the Rhone, but was offered a small government position in Paris. He accepted this, but, according to his friends, he felt the humiliation keenly and was constantly bewailing his ruined career. When he shot himself his friends attributed the act to profound melancholia, which inference was supported by the absence of financial or domestic difficulties.

A new interpretation of the act is now advanced. It is recalled that a strange discovery was made in the building occupied by the Rhone prefecture. The chief of the departmental police, Meyer, being ill, remained home for several days. As the prefect required some papers in Meyer's office he sent for the keys. These Meyer refused. The prefect insisting, Meyer, tho still ill, went to the prefecture, entered the office, gathered a big pile of papers, which he hid under his coat, and returned home.

Then the prefect forced the door to Meyer's office. Rummaging around, he discovered a series of mysterious wires. Investigation showed that these started from a concealed telephone and ran to the prefect's private office, dining-room and bedroom, where they were severally attached to sensitive plates hidden in the floor and walls in such a manner that the slightest sound was absorbed and thus communicated to the receiving end of the telephone.

This discovery was revealed to the public thru the newspapers. There was no intimation that the present prefect was greatly scared by the discovery, but the suicide of his predecessor, closely following the report of the finding of the secret telephone, was regarded as more than a mere coincidence, and that constant fear of some unknown Nemesis drove Gabriel Leroux to his death.

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TELEPHONE SWITCHBOARDS.

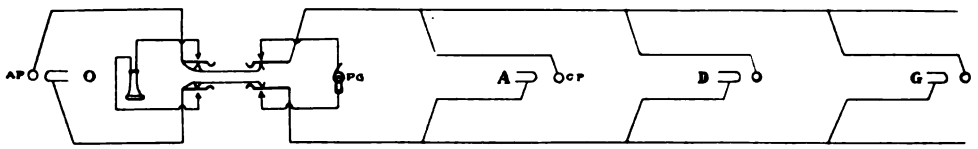
BY H. P. CLAUSEN.

(*Continued.*)

In the preceding article we have presented a description of an exchange system in which the trunking service is given by means of one-way trunks; that is, the outgoing end of a trunk circuit consists of a spring jack into which is placed the calling plug of a circuit requiring extension, the incoming end of the trunks terminating in plugs. Associated together with the jack and plug construction are the auxiliary contacts for controlling supervisory signals for the purpose of determining the used or unused condition of a trunking circuit. In many instances objections have been made against the use of a trunking jack at the originating operator's position. However, the writer will not discuss the advantages or disadvantages, but rather confine himself to a fair presentation of the systems under consideration.

The following is a description of an exchange system which has been in operation since the early part of 1898:

Each operator's position of the main switchboard is equipped with twelve pairs of interconnecting cords and keys. These equipments are similar in a general way to the ordinary magneto board interconnecting systems shown by Figs. 5 and 6, in the preceding articles. Now, referring to Fig. 18, it will be observed that the calling plug C P is extended to a number of like constructed plugs. Now, if the reader will refer to Fig. 17 it will be observed that the C P plug connects to the C P′ and the C P″ and the C P‴ plugs, and granting that the A B C D, etc., squares represent sections of switchboards, it will be noted that the C P plug circuit terminates at every third switchboard in the system.



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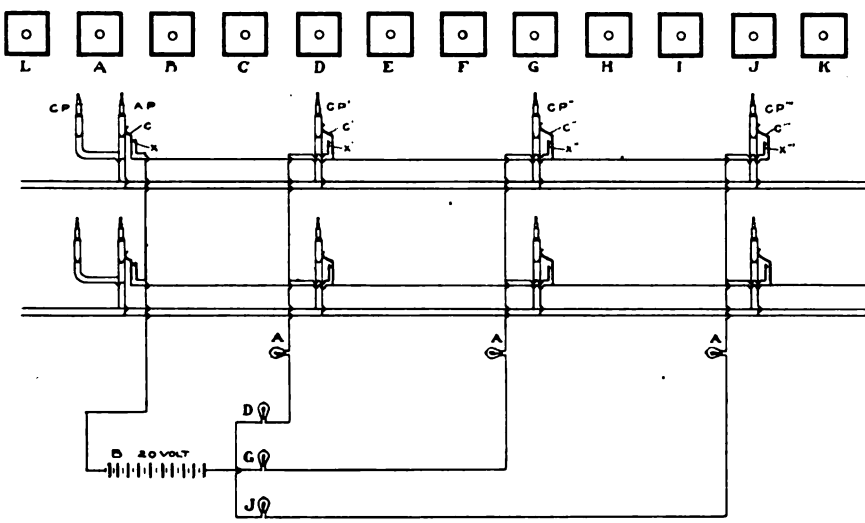

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In other words, if the A operator receives a request for connection with a subscriber located anywhere in the switchboard system, she is enabled to electrically connect her calling plug circuit with the called-for subscriber's line by requesting another operator to place a certain C P plug into the required line jack, for it is obvious that the D operator can reach any circuit on the C D or E board, while the G operator can reach any subscriber's line on the F G or H board, and that I J and K subscribers are reached from the J switchboard. Upon the receipt of a call by an operator at the A switchboard, the operation would be as follows: Picking up an unused answering cord and placing it into the caller's line jack, the operator would learn the caller's needs, which we will say is a request for connection with subscriber No. 620. Then knowing that the G operator has a direct reach control over subscriber No. 620, the A operator presses an order button connecting from her operator's telephone to the G operator's telephone, and requests that the G operator place the C P″ plug into the line jack No. 620. Upon the G operator complying with this request, the A operator completes the connection by signaling the called-for subscriber, the G operator having no further control over the C P″ plug, and after the interconnected subscribers have signaled for a disconnection, the A operator withdraws the answering plug and requests of the G operator that she withdraw the C P″ plug from the line jack. While the above system operated very successfully, it is obvious that much confusion would result if the second operator failed to withdraw a trunking plug from the line jack after having been requested to do so, for the originating operator might proceed to use the same interconnecting cord circuit for another connection, which might terminate in another trunking plug, say, C P′, and therefore again signal the subscriber connected to the C P″ plug, which, of course, would be productive of a great deal of confusion. Now, to overcome the objection of this system, the answering plug of each pair of interconnecting cords were equipped with a normally closed plug switch, as shown by Fig. 17, while all of the transfer plugs were likewise equipped with plug switches, which, however, are normally open, as shown. Referring to the diagram (Fig. 17), it will be observed that the spring C at the operator's position connects to the springs 1, 2 and 3, located respectively at the D, G and J switchboards, while the contact X connects to the battery B. The contacts X′, setting under the spring 1, connects to the lamp A located behind the C P′ plug and the lamp D located behind the C P plug. The spring X″ connects to the A lamp on the G board and to the G lamp on the A board, while the X‴ spring connects to the A lamp on the J board and the J lamp on the A board. Now, then, in operation, A operator picking up the A P plug results in causing the C spring losing contact with X, thus opening the circuit at that point. Now, then, if the connection is a local one, the C P plug would be placed into the called-for subscriber's line jack, no trunking being necessary. In case, however, the connection required to be extended to another board, she would have ordered up the C P″ plug, which, upon being lifted from its socket, would result in causing the spring 2 to make contact with the X″ point, but inasmuch as the C spring is opened at the A operator's position, the lamps G and A would of course remain unlighted. However, on receipt of a clearing signal, the A operator would withdraw the A P plug from its connection, and upon reseating it would cause the spring C to again make contact with the point X, and thus complete the circuit comprising the battery B, lamps G and A, causing the latter to burn and remain lighted until the G operator withdrew the C P″ plug and reseated it into its socket, which would result in opening the contact between the 2 and X″ springs, which would, of course, result in extinguishing the A and G lamps. With this system of trunking there remained no chance for confusing the connections, once made, with other connection being made immediately afterward, for the A operator would have a signal before her indicating at which section of switchboards a trunking plug

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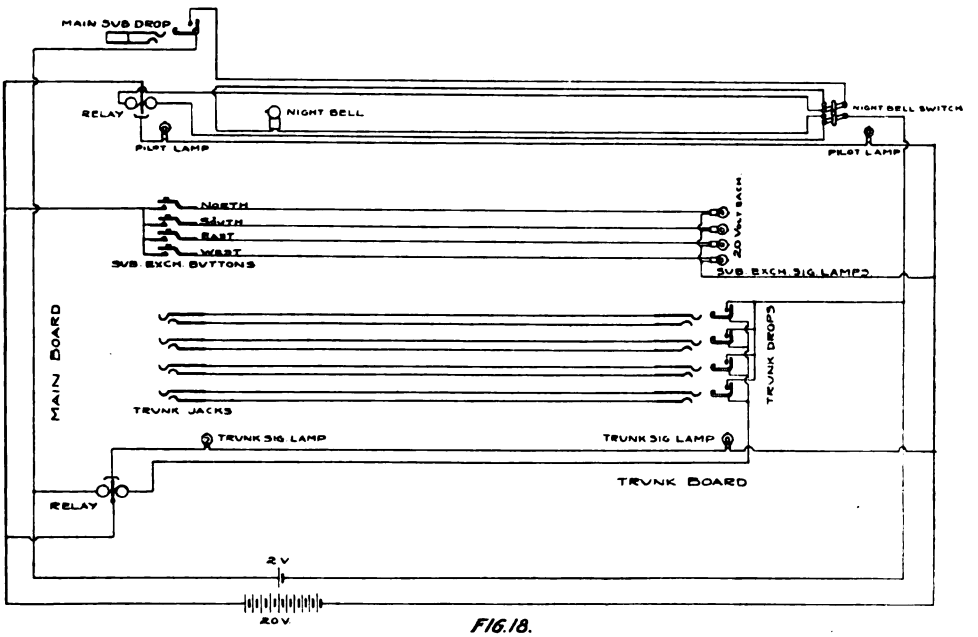
had not been reseated, while the G operator would have a visual signal before her indicating a request for disconnection. While the diagram presented may be understood to show a complete system of signaling for one interconnecting circuit, which gives the A operator three lamps for each cord circuit and, with twelve pairs of cords, thirty-six lamps, this method need not be followed out in practice, as all the cords of the A operator might operate the C springs all direct, as shown, while the X spring would be commoned to the battery B, and also at the D operator the C^1 spring would be operated direct, and the X' springs commoned to the A and D lamps located respectively on the D and A boards. In practice it was found that one lamp located behind each set of twelve cords sufficed to control the trunking circuits, while the A operator would have a lamp connecting to each set of twelve cords, the lamps having distinctive color prisms for the purpose of identification. Thus, for example, supposing that the A operator had extended the connection to another section and after receiving a clearing signal, withdrawn and reseated the answering plug, she would have been notified at which position the connection had been previously extended to by noting which lamp might be lighted, and in case that the connection did not immediately become clear she would press the order button corresponding to the lighted lamp and request the second operator to clear the No. 4, 5 or whatever interconnecting circuit it might be. This system of signaling has been used quite extensively and found to give excellent service.

Reference has been made to the auxiliary board shown in Fig. 16, and as was explained, this auxiliary board is



F16.18.

used as a means for connecting the main switchboard and sub-offices with each other. Referring to Fig. 18, we have a diagram of circuits which should be referred to in following the description of the trunking system. As was explained before, there are four sub-offices connecting to the main exchange thru the auxiliary switchboard. These sub-offices terminate in jacks, drops and plugs on the auxiliary board. That is to say, the sub-office circuits are connected in such a manner that a signal may be sent into the auxiliary board and received at

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the latter by the dropping of a shutter. The main switchboard connects to the auxiliary board by means of transfer jacks, the auxiliary board terminal comprising a signal actuated either by the main operator throwing generator current on to the circuit, or by means of auxiliary contacts, either of which systems can be and has been applied in service and found to give satisfactory results.

In addition to transfer jacks, the main operator's positions are each equipped with four contact keys, these contact keys being connected to signal lamps on the auxiliary board, one signal lamp corresponding to each sub-office, the lamps having different colors and the contact keys being lettered according to the name of the exchanges. Thus, for example, the upper button might be north, the second one south, the third button west and the fourth button east. Operation would be as follows: The main operator receiving a request for a connection with a subscriber's circuit located, say in the north office, she would have selected any vacant trunk circuit and operated the auxiliary board signal of that circuit. This signal of itself, however, would not indicate to the auxiliary operator the exchange to which the connection needs to be extended, but at the same instant that the main operator places her plug into the trunk jack she would have pressed the north key and lighted the north signal lamp. Now, then, upon the auxiliary operator observing the lighted north lamp, she would have placed an unused north exchange plug into the main board trunk circuit with the exposed signal. Now, then, at the sub-office this circuit terminates in an operator's telephone. Thus the moment that the auxiliary operator placed the sub-office plug into the main office trunk jack, the main office operator's circuit would have been placed in connection with the sub-office operator's circuit, and the main operator's wants attended to after the order had been given.

In the event that a sub-exchange operator desired to extend a connection thru the main exchange, she would have placed her calling plug into any vacant trunk jack and at the same time signaled for attention by actuating the auxiliary board signal. Now, if it will be remembered the sub-office trunks terminate in drops, jacks and plugs on the auxiliary board, and upon the auxiliary operator receiving an order from the sub-office operator for extending the circuit thru to a certain main operator, she would have placed the trunking plug (corresponding to the calling circuit) into a transfer jack connecting with the desired main operator's telephone set thru a transfer plug normally left in a spring jack bridged on the main operator's receiver. This operation having been performed, the sub-office operator would proceed to give the order, the main office operator then withdrawing the transfer plug from the telephone jack and placing it into the required subscriber's line jack.

In considering the operation of the above system, it should be borne in mind that the auxiliary operator is enabled and expected to train herself in being able to perform two things at one time; in other words, she is able to establish an outgoing trunk connection at practically the same instant while making an incoming trunk connection, for the incoming trunk order is received by hearing the order while the outgoing trunk order is received by the combination of lamp colors and drop shutters.

GERMS IN TELEPHONE TRANSMITTERS A MYTH.

According to General Manager A. S. Hibbard, of the Chicago Telephone Company, efforts have been made at various times to find germs in transmitters, but without success. Several inventions for destroying those that existed, in theory, have been tried, but without results. "I have taken up this very matter with the health department here in Chicago," declared Mr. Hibbard, referring to a report of a new device just invented. "I have yet to hear of the first case of sickness traceable to such a source. It is not impossible, I admit, but highly improbable. I look upon such devices as a nuisance and would not give one even a trial."

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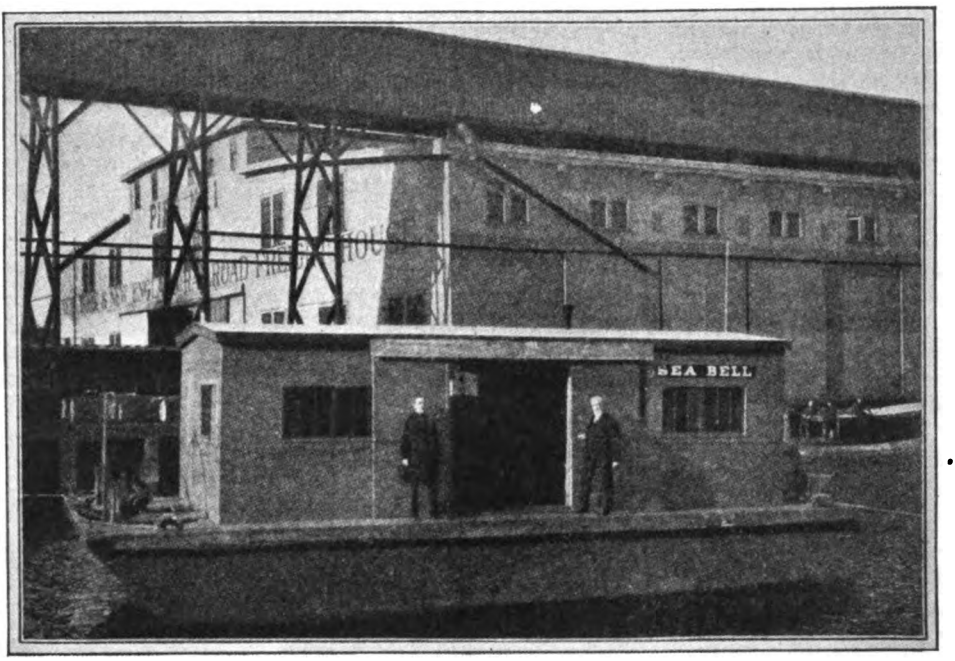

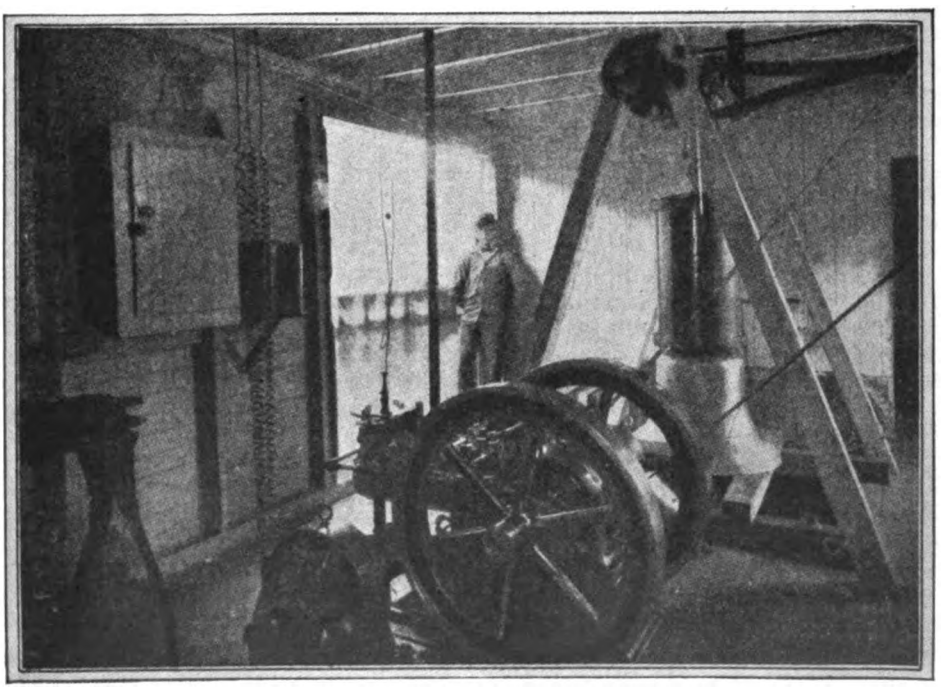

The upper view shows the Sea Bell, the barge that was fitted out for these experiments by the late Professor Gray and Mr. Mundy. In the illustration Professor Gray and Mr. Mundy can be seen standing on the side of the barge. The lower view shows the interior of the barge, showing the bell and the apparatus for lowering it into the water.

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REMARKABLE DEVELOPMENT IN SUBMARINE SIGNALING.

Some time ago the English government detailed Captain Bailey, of the British Navy, to examine and report upon the progress made in this country, of wireless signaling under the sea. Experiments at this time were conducted by the late Prof. Elisha Gray, of Chicago, and Arthur J. Mundy, of Boston. It was Mr. Mundy who first conceived the idea of submarine wireless signaling, and when Professor Gray, with his wonderful knowledge and deep research in electrical problems of all kinds became interested, and thru the mere pleasure of developing the idea, agreed to collaborate with Mr. Mundy, it meant that the problem would be solved, and that a practical system of wireless submarine communication would become a possibility. The idea of communication between a vessel and the shore or between two vessels first struck Mr. Mundy while on a vacation trip in 1898, on a Mississippi River steamboat, from New Orleans to St. Louis. Dewey was at Manila and Cuba was being invaded. The passengers in the steamboat made each stopping place along the river an excuse to learn the latest news and hurrah for Dewey and their country. Residents along the river were even then much alarmed over the possibilities of Spanish war-ships attacking the Gulf Coast. The idea occurred to Mr. Mundy what a great help to the country it would be, if wireless communication by water could be established. Naval strategy would be entirely changed. The installation of a pair of ears aboard every man-of-war would insure immunity from attack, either at night or during a fog by any class of boats or submarine torpedoes. He remembered of once reading in Professor Tyndall's monograph on "Sounds and Fog Signalling," that three hundred wrecks a year on the English coast were due to fogs. He knew Holland, and had seen every part of his wonderful submarine boat; and how the largest war-ship in the world would be at the mercy of this unseen foe, which under twelve feet of water would stealthily creep to the battleship of the enemy and fire a torpedo into the hull that would sink the war-ship before the existence of the submarine torpedo boat could be discovered. Mr. Mundy had often remembered, when a boy, of striking two stones together under the water and hearing them with his head under water, at a greater distance than he could when head and stones were above water, and it occurred to him that a submerged bell, when vibrating from the effects of a powerful blow, could probably be heard for miles under water. The more he thought about the matter, the greater became the possibilities of its development.

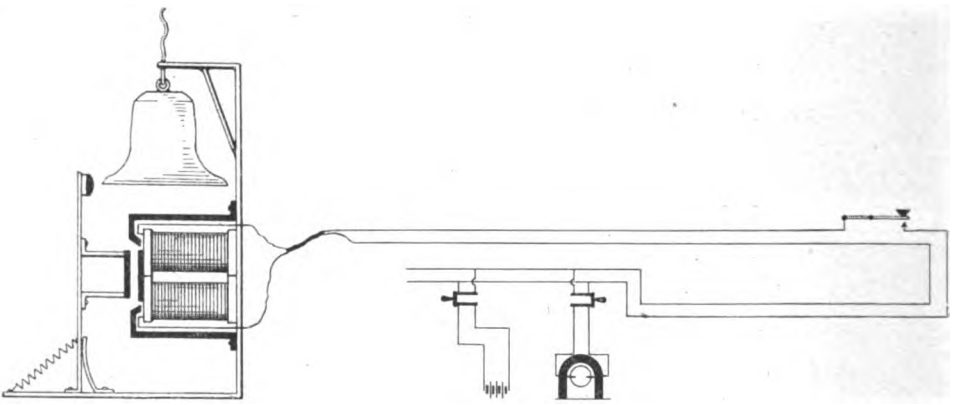

FIG. 1.

As a result, he wrote a long letter to his friend, Professor Gray, at Chicago, elaborating the idea and making some suggestions regarding the method of

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some interesting experiments. The inventor of the telephone, type-writing telegraph, automatic telegraph switch and the annunciator of every-day use, was immediately interested. Perhaps there was no better authority on acoustics in the country than Professor Gray. He visited Mr. Mundy's summer home on Cape Ann, Massachusetts, late in the summer of 1898, and from that time up to the day of his death, last January, did little else than work with Mr. Mundy on a system of wireless submarine signals. Very little was known on the subject of marine acoustics and the two friends and inventors were proceeding on lines heretofore unknown, as all signaling devices of the present day were those adapted to be used thru the air. They knew before they started that water, as a conductor of sound signals, was a much more dependable medium than air. The capacity of air for conducting sound depends on atmospheric conditions, such as heat, cold, fog, rain, snow and electrical storms; water will conduct sounds uniformly no matter what the atmospheric conditions may be.

Professor Tyndall, the British authority on Physics, in his researches on the acoustic transparency of the atmosphere, takes up the topic of experiments during a heavy fog on the Maine coast and shows the difficulties attendant upon the transmission of sounds thru a fog. Bells and whistles were frequently heard much farther against the wind than with it; the whistle on the government pier on Cape Elizabeth could frequently be heard distinctly in Portland, nine miles away, even in a heavy snow storm and with the wind blowing a gale directly from Portland to the Cape. This indicates that a volume of air of an equal temperature in an opposing wind is more favorable for the transmission of sound than a favoring wind having the air stratified by unequal temperature. Again, in moving from a signal station, sounds will be readily heard for a mile, then lost for some distance,

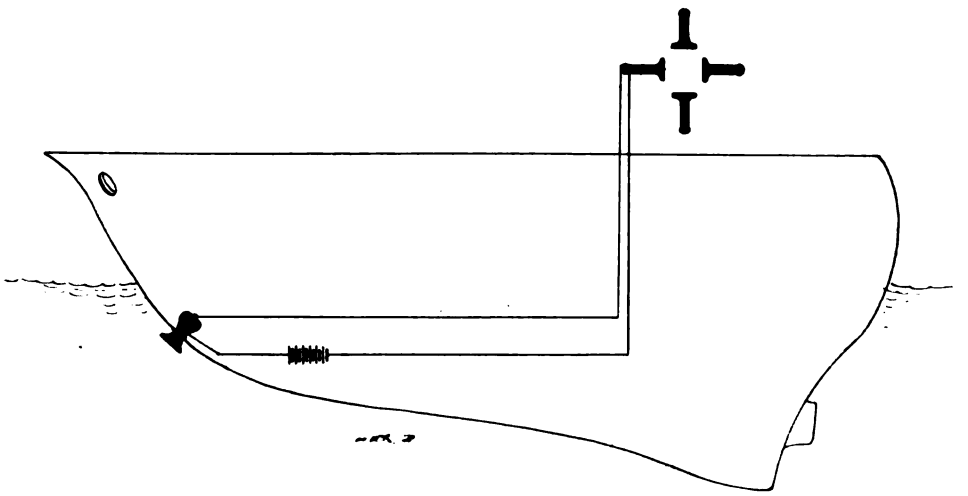

FIG. 2.

when they can again be readily heard; this illusive characteristic is common to all air signals. A man cutting hay in a field near a railroad may see the locomotive in the distance and not hear the whistle, while another man a mile away, who can not see the train, may hear its whistle quite distinctly; all this the inventors knew, and what they had to contend with was totally different in its nature. They were well posted on acoustics generally and the velocity of sound thru liquids; they tried the tones of different bells in shallow and deep immersion in all kinds of waters; they next tested the carrying capacity in sound of blows delivered on the rim of a bell by electric hammers; they devised

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a keyboard and a system of sending telegraphic messages, and experimented with all kinds of receivers, from the human ear, held against the side of a ship, to a telephone receiver. Each experiment seemed to be more successful than the last, and when some naval officers became interested, the United States Government granted the use of its light-house tenders, its various sound signal devices and all the courtesies possible in the Coast department. It soon became evident that they would proceed much faster if they could have a boat designed and built for their special requirements; and so it happened that the homely but useful scow christened the "Sea Bell" was built. She is fitted with a 6-horse-power gasoline engine, which drives a small dynamo, A six-foot well hole is cut in the center of the hull, thru which the bell is lowered, the bell being fitted with an electric hammer. When lowered into the sea by a windlass, an ingenious electrical mechanism enables the operator to ring the bell with any desired number of strokes; hence it became easy to transmit intelligible messages by having each letter of the alphabet represented with a given number of strokes. At a distance of a mile the sound of a bell may be distinctly heard by the ear; it comes thru the water, passes thru the sides of the ship into the hold and is heard just as any local sound might be. At a distance of three miles, signals are readily heard thru a common tin ear trumpet which is screwed to the end of a piece of gas pipe, the mouth of the trumpet sealed by a tin diaphragm and when submerged six feet under water, enables the listener at the upper end of the pipe to hear distinctly. For greater distances an electrical receiver is used. The submerged end of this receiver is lowered over the side of the ship or attached to the hull under the water line; it is connected by wires to a telephone receiver, which may be carried to any part of the ship, where the navigator can receive signals for a distance of twelve miles.

An improvement for the electrical receiver has been devised by Professor Gray, by means of which, whenever the submerged bell is rung, a large gong will ring automatically in the pilot-house. This gong rings sympathetically, there being no connection other than the sound waves traveling thru the water from the bell to the ship, the gong following the bell, stroke by stroke. The utilization of this principle is entirely practicable in running a cable of a dozen miles out to sea, over the bed of the ocean and attach it to the buoy, sufficiently submerged beneath the wave surface to be secure at all times. The bell being equipped with an electrically swung hammer, will ring steadily at stated intervals from the shore station, and any vessel coming within two or three miles of this unseen but clearly heard sentinel will be warned of her danger by the sympathetic strokes of the gong in her pilot-house.

Such a signal, anchored within a mile of the San Francisco shore, would have prevented the wreck of the steamship City of Rio Janeiro, which occurred during a heavy fog last February, causing a loss of one hundred and twenty-eight lives and $1,000,000 worth of property. The United States Government has spent a great deal of money and time in trying to secure an atmospheric fog signal that can be always depended upon, regardless of the weather conditions, but without success. The conditions which prevent success in transmitting signals thru the atmosphere do not exist in transmitting signals thru the water, the uniform density of which carries a sound, once started, clearly in all directions without deviation, and without being deflected by currents to any considerable extent.

Professor Gray had designed a great improvement over the receiver that had been used in the earlier experiments; this receiver will enable the navigator to tell with absolute precision at which point of the compass the bell is located, and when the vessel is within hearing of two bells the navigator, knowing the angle of each, can pick out his ship's position on the chart, within a cable length. Mr. Mundy has just patented a method, by means of which a ship coming in from the open sea may find her way straight to the entrance of

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the harbor, by simply feeling her way along until she finds herself in a position where the sound from two bells, one on either side of the entrance, are heard simultaneously on board ship. Sound travels at a fixed speed in the water and as the bells are placed at equal distances from the entrance, and are rung by a cable connection at precisely the same instant, the vessel must be in her right course in order to hear them simultaneously. The bells having different pitched tones, the navigator, hearing the higher toned bell first, knows that he is nearer to it than to the tower toned bell and vice versa. The length of the interval of time between the two sounds will give him an approximate idea of how far his ship lies from the line indicated on his chart. As soon as he reaches the point where the two bells are heard simultaneously, his chart will tell him the exact course by the compass, to the mouth of the harbor, which course he can maintain, by the sound of the bells. While this system does not require the use of Professor Gray's receiver, which determines the directions from whence the sound comes, the two methods may be used to prove each other. A third bell may be placed in triangular relation to the other two and with three bells thus sounded simultaneously at given intervals, the navigator can pick his position on the chart within a ship's length, even when sailing ten miles from shore.

An incoming Atlantic liner, equipped with a submarine bell, could announce its arrival off Fire Island, irrespective of fog or darkness. The electrical receiver can also be used for detecting the approach of a submarine torpedo boat, the noise of which can be plainly heard at a distance of several miles, the sound being intensified by the fact that the submerged boat must transmit all its vibrations to the water, and the Navy department of the United States has offered a vessel for making this test at Annapolis, in the near future. It was proposed by the inventors to station along the coast, at intervals of ten miles, a series of submerged bells, to be rung electrically from a shore station. These bells to announce their identity either by ringing a different signal number, or by sounding a different pitch. Their position will be charted so that the navigator, hearing the number or pitch, will identify each bell and locate its geographical position in fog or storm, night or day. A practical demonstration was given to a number of interested scientific and business men last December and the entire success of the demonstration was evidenced by all signing the following statement:

"We have this day heard the submerged bell (struck electrically from the experimental station on board the Sea-Bell) thru the electrical receiver (submerged from the deck of a steamer engaged for the purpose) at a distance of one and one-half, four, eight, and twelve miles in open sea.

"At one and one-half miles the sound of the bell was heard very loud and very distinctly; at four miles the sound was quite as distinct and almost as loud as at one and one-half miles; at eight miles the sound was quite as distinct as at one and one-half miles, and almost as loud as at four miles; at twelve miles the sound was heard at times quite distinctly, and at times somewhat feebly.

"Even at twelve miles the sound received was sufficient to give a practicable warning signal.

"The bell was also heard in the forehold of the steamer without any receiving apparatus whatever, at a distance of one-quarter mile, so loud that it seemed to be right alongside the ship; and at a distance of one and one-half miles it was heard faintly but unmistakably, in the same position in the hold, and without any apparatus for detecting sound."

A PLUCKY TELEPHONE GIRL.

The Citizens' Telephone Exchange was completely destroyed by fire the night of April 5. Miss Ella May Wilson, night operator, with the switchboard on fire and electric flashes almost blinding her, stuck to her post long enough to call up the manager and then to do what few men in her place would have thought of. She rang up the electric light plant and had the current shut off. Her hands and hair were badly singed, and the exchange completely wrecked. It will be rebuilt at once.

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CONDENSER MAKING.

BY WILLIAM MEYER.

In these days of central energy systems, where it is often convenient and again absolutely necessary to introduce in a circuit a medium, which will effectively check the flow of continuous currents and still permit the passage of undulatory and alternating currents, condensers properly constructed form this medium most effectively and economically.

The writer having for more than five years been engaged with telephone manufacturing concerns, who use condensers extensively in their circuits, it is his purpose in this article to give such details concerning the manufacture as will enable others not acquainted with the process to make them.

To commence it will be first necessary to procure the proper paper and tin or lead foil; for you can hardly call it tinfoil when eighty per cent of the composition is lead. The paper should be procured in rolls, eight and one half inches wide, one-thousandth to twelve ten-thousandths of an inch thick and of a quality like fine white tracing paper.

The foil should be in rolls, seven and one-half inches wide, of a thickness corresponding to that of the paper. For the terminals sheet brass or german silver, No. 30 B. & S. gauge, is to be used. This will have to be cut to shape, as shown in Fig. 1.

The next step will be to rig up a suitable frame for holding the spools of foil and paper, as well as rolling the condensers. The form over which the condenser is wound is shown in Fig. 2. It may be provided with a crank and a ratchet at one end, the ratchet to be engaged by a dog in the frame, to prevent back movement when rolling the condenser. The other end of the frame should be provided with a small cam to permit a blade A, which is hinged at B, to slide down for removing the condenser after it is rolled.

Since no paper is procurable which is free from pinholes, therefore it is necessary to use two layers of paper, between the adjacent layers of foil. Fig. 3 shows how the paper and foil is to be disposed. First one and a half turns of Nos. 4 and 5 are taken over the form, then Nos. 1, 2 and 3 are brought up. Next, one turn of No. 3 is taken around a terminal, shown in Fig. 1. Nos. 1 and 2 are pulled a half turn farther forward and two turns of Nos. 1, 2, 3, 4 and 5 are taken. Now No. 6 is brought up and twenty to twenty-eight turns more are taken for a one micro-farad condenser. A quarter turn farther No. 3 is dropped and a half turn farther Nos. 4 and 5. Nos. 1, 2 and 6 continue for two turns, when No. 6 is cut and

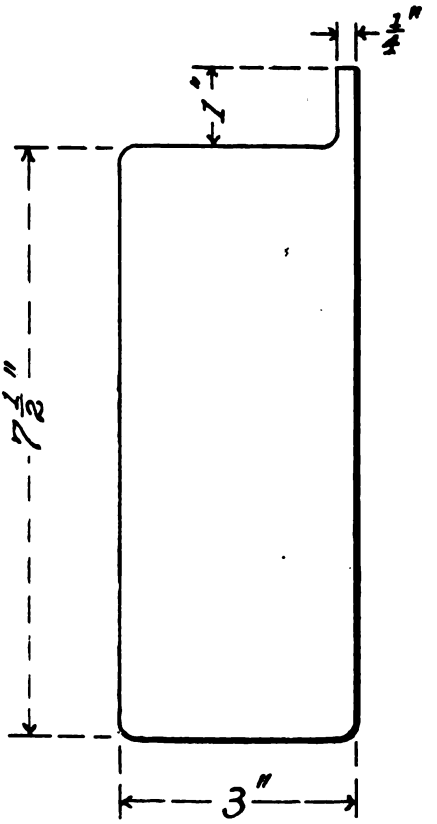

FIG. 1.

wrapped around another terminal. One more turn is taken over this with Nos. 1 and 2, when these are also cut. Next the condenser is tied with a piece of string to keep it from unrolling, then the form is lifted from the frame, the cam at the end unclamped, which allows the removal.

In explanation of the statement that from twenty to twenty-eight turns are

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taken, I will say that with a fine quality of paper and foil of minimum thickness, twenty turns will be sufficient, while with coarse and poor material more turns are needed. As made by the Western Electric Co., twenty turns are used, and twenty-eight turns by the Kellogg Switchboard & Supply Co. To get two micro-farad, the W. E. Co.

The paraffin is kept at a temperature of 280 degrees, and when all bubbles cease to rise the condensers are ready to be pressed. These presses are of a substantial character, of a general design similar to a letter-press, with a press space of about 8 inches high. It will be necessary to heat the presses, as otherwise the cold mass of metal will

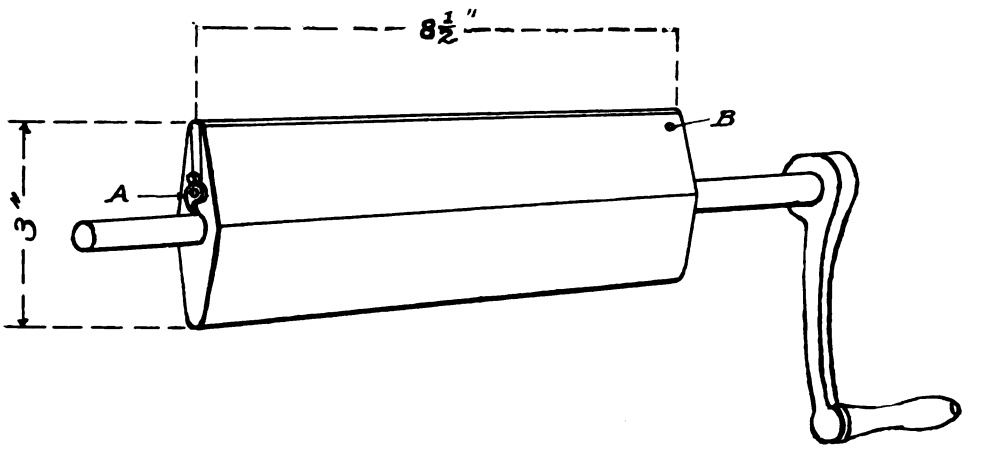

FIG. 2.

use two of a capacity of 1 M. F. each, while the K. S. & S. Co. double the number of turns, making it fifty-six. This when compressed will have a thickness of about 25-32 inch, while two of the W. E. Co's will measure about 17-32 inch together.

After the condenser is removed from the form, it is put into the baking oven, a large sheet-iron affair of cubical form provided with shelves near the top to

chill the paraffin before the screw pressure can be applied.

It is therefore well to arrange a series of five or six presses on a low iron truck run on rails so arranged as to permit putting the whole outfit into the baking oven, where the presses may be warmed. To what thickness the condensers must be compressed in order to have the proper capacity, is a matter of experiment, varying with the thickness

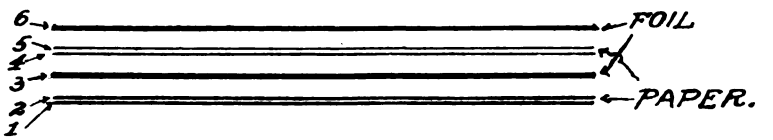

FIG. 3.

place the condensers and having a number of gas burners near the floor for heating the apparatus and thus expelling every vestige of moisture from the condensers, which are taken from here to the paraffin vat, wherein they are submerged, being held in a vertical position by metal strips in form of links slipped over rods.

and quality of paper and foil. The resistance of a well-made 1 M. F. condenser will measure from 1,000 to 2,500 megohms. About five 1 M. F. condensers may be put under a press at a time, a ⅛-inch piece of sheet steel to be placed between adjacent condensers. The base plate of a press should have a groove all around near the edge, also a couple

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of holes, so that the paraffin pressed from the condensers may run off into a shallow pan under the truck, from where it may be returned to the vat. When all the presses on a truck have been filled, it will have to be put aside to cool before the condensers are removed.

Since it takes from one hour to one hour and a half for the press to cool sufficient to permit the removal of the condensers, a number of presses, which take up considerable room, are necessary to do a day's work with any kind of a working force.

To overcome this defect, the writer suggests that, instead of putting the condensers directly into the press, a ¾-inch iron plate, planed on both sides, be put at the bottom into the press, then the condensers, alternated with the pieces of sheet steel and on top a similar plate. After the proper pressure has been applied, these plates may be locked by a couple of rods and turnbuckle at each end. Now the screw may be released and the plates with the condensers between carried to a cooling place.

In this way all the work may be done with about six presses and a hundred sets of plates. After cooling, the condensers should be tested and marked. They are then to be wrapped with several layers of manila paper and put into tin cans. These tin cans should be about a sixteenth of an inch larger all around, with an extra quarter inch height, this space to be filled with paraffin just above the point of fusion. After this has cooled and hardened, the cap may be soldered in place, likewise the terminals, and another test made. The cost of the condenser made in this manner will be very small.

CHARLESTOWN, MASS., Dec. 22, 1900.

Electrical Engineering Publishing Company, Chicago, Ill.:

DEAR SIRS,— Please find enclosed P. O. money order for $1 to renew my subscription to THE TELEPHONE MAGAZINE. Your publication is indispensable to the progressive telephone engineer.

Yours very truly,

F. H. WILKINS.

BIG TELEPHONE COMBINE.

Final steps were taken in the big telephone consolidation scheme engineered by the syndicate headed by George R. Webb. At the meeting of the directors of the United Telegraph and Telephone Company, the following properties were acquired: Maryland Telephone and Telegraph Company, capital stock $1,000,000; Pittsburg and Allegheny Telephone Company, capital stock $1,500,000; West Penn Long Distance Telephone Company, capital stock, $1,000,000; Home Telephone and Electric Company, capital stock, $200,000; Allegheny County Telephone Company, capital stock $200,000; Hartford County Telephone Company, capital stock, $10,000.

In all about 50,000 telephones, either in actual operation or under contract awaiting installation, will go into the combination. The United obtains a strong position in the Pittsburg territory by the interests absorbed there. This territory is regarded from a Bell standpoint as the third best in the United States for local service and second only to New York for long-distance business.

The West Penn Long Distance Telephone Company owns the line from Pittsburg to Beaver, Pa., where connection is made with the United States Long Distance Telephone Company that will give service into Cleveland and other Ohio and Indiana points. More than 167,000 telephones will be connected up by this line with the Pittsburg and Allegheny plant. This will give first-class telephone connection to enter Pennsylvania.

The United Telegraph and Telephone Company, which absorbs these extensive interests, was chartered under the laws of New Jersey. It has a capitalization of $5,000,000 of common stock and $2,500,000 of 6 per cent cumulative preferred stock. The financial plans provide for the issuance at once of $3,500,000 of the common stock and $2,000,000 of the preferred. An underwriting syndicate has been practically completed to take the $2,000,000 of preferred stock at 85 per cent.

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THE BELL STATEMENT FOR 1900.

The annual meeting of the American Telephone and Telegraph Company was held in New York city on Tuesday, March 26, at the office of the company, 15 Dey street. The following report to the stockholders was submitted by the president pro tem., and also the financial statement of the treasurer for the year ending December 31, 1900:

To the Stockholders:

The output of telephones from 1891 to the first of the current year, and the various statistics of the companies operating under our licenses, are exhibited in a consolidated form in the tables which follow on next page.

The tables of mileage herewith include the long-distance toll system owned and operated by this company. This system consisted on the 1st of January, 1901, of 12,427.63 miles of pole line and cable, and 167,410.39 miles of wire, connecting 359 offices; a gain during the year of 420.80 miles of pole line and cable, 17,030 miles of wire and 36 offices.

The following comparative statement shows the number of exchange stations of the companies with which the long-distance lines directly connect, and which furnish the terminals of that system:

	Number of Stations.	Connected by Metallic Circuit.	
		Stations.	Per Cent.
January 1, 1900.....	557,979	311,129	55 76
January 1, 1901	697,674	438,222	62 81
Increase.....	139,695	127,093	7 05

The investment in line construction, equipment and supplies for this system up to December 31, 1900, amounted to $16,152,020.72. The gross revenue from the toll traffic upon these lines shows an increase of 13 45-100 per cent over the amount earned in 1899.

At the close of the year 1899, the property and business of the American Bell Telephone Company, except its holdings in the stock of this company, were taken over by this company.

The revenue statement appended to this report on the following page exhibits, therefore, as there stated, the result of operations of the combined properties for the entire year 1900, as compared with the total of revenues and expenses of both companies in 1899.

The exchange of shares under the circular of the American Bell Telephone Company, dated April 18, 1900, by the terms of which two shares of the stock of the American Telephone and Telegraph Company were given for each share of the American Bell Telephone Company has been substantially completed.

By a circular dated April 18, 1900, this company offered for subscription by its shareholders one new share for each five shares held by them after the exchange before referred to.

Of the total number of shares so offered (103,545), 103,018 were subscribed for and 51,175 shares were issued on August 1, 1900, and 50,843 shares on January 15, 1901; those remaining (527 shares) were sold at auction and issued in February, 1901.

Collateral trust four per cent bonds to the amount of $10,000,000 were sold during the year.

The past year has been one of marked progress in the development of the business, the increase in number of exchange subscribers having exceeded that recorded in any previous year.

During the last three years the number of exchange stations has increased from 384,000 to more than 800,000. This remarkable growth has been due in great measure to the adaptation of improved methods of construction and operation to the needs of subscribers.

The general adoption of the measured service system and metallic circuit party lines, with corresponding lower rates, has attracted many thousands of subscribers, both business and residence, who were previously deterred by the higher cost of other classes of service.

All this has been brought about, moreover, without impairment of the quality of service; as a whole, the standard of construction and efficiency

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of service has been steadily advanced thruout the country.

In the larger exchanges the old type of multiple switchboards is fast being replaced by relay boards equipped with electric lamp signals and central battery plant, installed in buildings specially designed for the purpose, and owned by the companies.

Material progress has been made also in underground construction, so that at the close of the year, 705,000 miles, or more than half the entire mileage of exchange conductors, were operated under the surface of streets.

Most of the gain of exchange stations consists of those connected by metallic circuits. At the end of 1900, there were 538,000 of that class, making an increase of 154,000 during the year.

It is doubtless true that, in certain localities, rates too low to cover current

INSTRUMENTS IN THE HANDS OF LICENSEES, UNDER RENTAL.

THE FIGURES IN LOWER LINE SHOW INCREASE FROM YEAR TO YEAR.

Dec. 20, 1891.	Dec. 20 1892.	Dec. 20, 1893.	Dec. 20, 1894.	Dec. 20, 1895.	Dec. 20, 1896.	Dec. 20, 1897.	Dec. 20, 1898.	Dec. 20, 1899.	Dec. 20, 1900.
512,407	552,720	566,491	582,506	674 976	772,627	919,121	1,124,816	1,580,101	1.952.402
	40,313	13,771	16,015	92,470	97,651	146,494	205,725	455,255	372,311

EXTRA-TERRITORIAL AND TOLL LINES.

	Jan 1, 1892.	Jan. 1, 1893.	Jan. 1, 1894.	Jan. 1, 1895.	Jan. 1, 1896.	Jan. 1, 1897.	Jan. 1, 1898.	Jan. 1, 1899.	Jan. 1, 1900.	Jan. 1, 1901.	Increase.
Miles of pole lines...	41,298	42,894	46,727	49,324	52,873	60,453	67,791	75,718	89,292	101,087	11,795
Miles of wire.....	115,088	133,002	154,106	180,557	215,687	268,866	324,883	385 911	501,832	607,599	105,767

TOLL CONNECTIONS.

The average daily number of toll connections is..... 148,528
Or a total per year of about..... 47,800,000
The toll revenue reported by all companies for the year 1900 was $8,972,030.90*
* Not including herein earnings of the American Telephone and Telegraph Company, which will be found in the comparative statement of revenue and expenses appended hereto.

EXCHANGES.

	Jan 1, 1892.	Jan. 1, 1893.	Jan. 1, 1894.	Jan. 1, 1895.	Jan. 1, 1896.	Jan. 1, 1897.	Jan. 1, 1898.	Jan. 1, 1899.	Jan. 1, 1900.	Jan. 1, 1901.	Increase.
Exchanges.....	788	812	838	867	927	967	1,025	1,126	1,239	1,348	109
Branch offices.....	509	539	571	572	686	832	937	1,008	1,187	1,427	240
Miles of wire on poles	180,139	201,259	214,676	232,008	260,324	286,632	327,315	396,503	509,036	627,897	118.861
Miles of wire on buildings	14,954	14,980	16,492	14,525	12,861	12,594	13,776	15,329	15,087	16,833	1,746
Miles of wire underground	70,334	90,216	120,675	148,285	184,515	234,801	282,634	358,184	489,250	705,269	216,019
Miles of wire submarine	1,020	1,336	1,637	1,856	2,028	2,818	2,675	2,973	3,404	4,203	799
Total miles of wire.	266,456	307,791	353,480	396,674	459 728	536,845	626,400	772,989	1,016,777	1 354,202	337,425
Total circuits	186,462	201,322	205,891	212,074	237,837	264,645	295,904	338,293	422,620	508,262	85,642
Total employes	8,376	9,970	10,421	11,094	11,930	14,425	16,682	19 668	25,741	32,837	7 096
Total stations.....	216,017	232,140	237,186	243,432	281,695	325,244	384,230	465,180	632,946	800,880	167,934

EXCHANGE CONNECTIONS.

The estimated number of exchange connections daily in the United States, made up from actual count in most of the exchanges, is 5,668,986.
Or a total per year of about 1,825,000 000.
The number of daily calls per station varies in different exchanges from 1 to 15$\frac{1}{10}$, the average thruout the United States being 7$\frac{1}{10}$.
The average cost to the subscriber varies according to the size of the exchange and character of the service from less than 1 to 9 cents per connection.

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expenses and necessary allowance for renewal have been offered, to meet similar rates offered by competitors. We believe, however, such conditions can not be lasting, and the growth thruout the country, as a whole, has been of a healthy and substantial character.

The expenditure to provide for extensions of the business thruout the country has been larger than that of any previous year. The new construction completed in 1900, by this company and the companies operating under our licenses, amounted to $28,862,970.85. Of this sum, $21,914,542.94 was expended upon exchange construction and equipment, and $6,948,427.91 upon toll lines. In addition to the above, $2,349,-103.28 was invested in real estate, to be utilized for exchanges and company offices. The entire expenditure for construction, including real estate, to the close of the last year, has been $168,-474,517.83.

Estimates already made indicate that the extensions of operating plant during the current year will require further expenditure on a large scale.

The year just passed rounds out the quarter century, within which is compassed the discovery and application of the art of transmitting speech by telephone. A brief review of the development and growth of this new industry, which has become so important a factor in commercial and social life, seems appropriate at this time.

Twenty-five years ago the wonderful invention of Professor Bell was made known to the world. Twenty-three years ago the first telephone exchange in the world was established in the United States, and from that beginning has been built up the great system of exchanges, and the network of connecting lines over which conversation can be held between points over a thousand miles apart.

Twenty years ago there were 47,880 telephone subscribers in the United States, and 29,714 miles of wire in use for telephonic purposes. At the end of last year, there were 800,880 exchange stations equipped with our instruments, and 1,961,801 miles of wire were employed for exchange and toll line service. The United States has, from the beginning, held the leading place among nations in respect not only of the extensive development of the business, but in the employment of modern and improved appliances, tending to greater efficiency of service.

LEDGER BALANCES, DECEMBER 31, 1900.

DEBTORS.

Construction, equipment and Supplies	$16,152,020.72
Telephones	4,311,928.75
Real estate	1,567,018.85
Stocks and bonds	71,719,324.01
Patent account	24,101.00
Machinery and tools	31,477.94
Cash and deposits	1,078,071 70
Bills and accounts receivable	5,240,640.27
American Bell Telephone Co	22,110,400.00

CREDITORS.

Capital stock		$89,100,500.00
Surplus		1,813,199.74
Bonds		10,006,000.00
Reserves		2,416,363.34
*Bills and accounts payable		2,928,709.91
Contingent		15,970,210.25
	$122,234,983.24	$122,234,983.24

WM. R. DRIVER, Treasurer.

March 26, 1901.

*Of this amount $1,282,277.25 is for the dividends payable January 15, 1901, to stockholders of record December 31, 1900.

COMPARATIVE STATEMENT OF EARNINGS AND EXPENSES.

EARNINGS.

	1899.	1900.
Dividends	$3,044,908.89	$3,846,821.67
Rental of instruments	1,714,526.54	2,427,037.52
Telephone traffic	2,668,359.01	3,027,171.85
Real estate	42,285.11	31,824.67
Interest	217,301.53	201,643.50
	$7,687,381.08	$9,534,499.21

EXPENSES.

Expenses of administration	$591,826.34	$746,259.48
Legal expenses	103,748.46	85,134.07
Interest and taxes	1,234,275.83	1,376,199.94
Telephone traffic	1,487,021.88	1,840,847.86
	$3,416,872.51	$4,048,441.35
Net revenue	$4,270,508.57	$5,486,057.86
Net revenue, 1900		$5,486,057.86
Dividends paid		4,078,601.25
		$1,407,456.61
Carried to reserves	$937,258.22	
Carried to surplus	470 198.39	
		$1,407,456.61

N. B.—The foregoing statement for 1899 is for the purpose of comparison and is made up of the transactions of the American Bell Telephone Company and the American Telephone and Telegraph Company in the same form as those which appear above for 1900.

WM. R. DRIVER, Treasurer.

March 26, 1901.

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In connection with the record of development of telephone service in this country, some comparison of the systems of foreign countries is of interest.

The latest reports that can be obtained, part of which are for the year 1899, others to the close of 1900, show the countries next in order to the United States, as respects the development of telephone service, to be the German Empire, having 229,391 stations; Great Britain, 171,660; Sweden, 73,500; France, 59,927; Switzerland, 38,864; Austria, 32,255; Russia, 31,376; Norway, 29,446.

As before stated, there were, at the close of last year, more than 800,000 stations connected with the exchanges of our licensee companies, which exceeds the aggregate number of subscribers in all the countries of Continental Europe.

In addition to this, there were over 40,000 private line stations equipped with our telephones.

The number of exchange and toll line connections in the United States now reaches almost two thousand millions yearly.

The suits of the American Bell Telephone Company *v.* National Telephone Manufacturing Company, *et al.*, and of the American Bell Telephone *v.* Central Telephone Company, *et al.*, brought under the Berliner patent in the Circuit Court of the United States for the District of Massachusetts, were argued before Judge Brown in November, 1899. On February 27, 1901, Judge Brown filed a decision for the defendants in each case. An appeal will be taken to the Circuit Court of Appeals.

For the Directors,

ALEXANDER COCHRANE,
President pro tem.

The old board of directors was reelected at the meeting, and Messrs. Edward W. Bell and John H. Cahill, secretary of the New York Telephone Company, were added to the board, Mr. Cahill taking the place of Mr. John E. Hudson, deceased. Routine business was transacted and after the usual reading of reports and the secretary's minutes, the meeting was adjourned.

Among those present were Messrs. Geo. V. Leverett, W. R. Driver, E. W. Bell, Henry S. Howe, W. D. Sargent, Charles E. Hubbard, Charles W. Amory, Alexander Cochrane, Thomas Sanders, Hon. John Bigelow, ex-Minister to France; E. J. Hall, Charles F. Cutler and Gen. Thomas Sherwin.

HYPNOTISM OVER 'PHONE.

A private hypnotic exhibition was given at Houston, Texas, by Lawrence Kenner, in which two young men were put into a hypnotic sleep over the 'phone.

The experiments of Mr. Kenner, who is in the employment of the Southern Pacific Company, were brought to the notice of Col. S. F. B. Morse, passenger traffic manager of that road, and Colonel Morse became deeply interested.

Kenner went to Beaumont after he had arranged to have two telephones connected at Houston with the same wire at the Tremont Hotel, at Houston. At 6 o'clock in the evening, Kenner stepped to the long-distance telephone at Beaumont.

Two young men took down the receivers at the Tremont Hotel, and after a few words of preliminary conversation Kenner said, "Drop."

Both men fell into the arms of attendants standing behind them, and physicians, including the city and county health officers, put them thru some very severe tests to determine if the hypnotic spell was genuine.

Two hours and thirty minutes after Mr. Kenner stepped into the Tremont Hotel and awakened the sleeping men.

TELEPHONE FOR HOTEL SERVICE.

A contract has been made by the Oliver Hotel, of South Bend, Ind., with the telephone company, by which the latter will install an interior telephone service in the hotel. A telephone will be put in each bedchamber, which will permit the occupant to telephone to any part of the city without leaving his room. But few hotels in the United States are provided with this convenience.

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EDUCATIONAL COURSE IN TELEPHONY.

BY A. J. KUSEL.

LOCAL ACTION AND AMALGAMATION.

Any chemical action taking place in a cell on open circuit tending to reduce its available potential energy, or any chemical action going on when the circuit is closed and not contributing to the production of the current, is called local action. Local action is always prominent with commercial zinc or any zinc when in an acid solution. The zinc contains foreign particles, such as bits of iron, carbon, or other conducting bodies; as soon as these are exposed to the liquid, they form closed local circuits, and the zinc is eaten away in patches, or pits.

To prevent this wasting action, the zinc is amalgamated. Alloys of mercury with other metals are called amalgams. The process of amalgamation consists in forming a zinc mercury alloy on the surface of the zinc plate or prism. This is best accomplished by first cleaning the zinc by immersion in sufficiently diluted sulphuric acid, and then rubbing mercury over the surface by means of a swab made by tying a piece of cloth round the end of a stick. All excess of mercury should be allowed to drain off. If, however, the plates of zinc stand out of the liquid for some time, particles of mercury will separate, and collect in small globules on the surface.

Another method of amalgamating zinc is to dip it in an acid bath containing a mercury salt in solution. This may be prepared by dissolving one part of mercury in three parts, by weight, of nitric acid and then adding nine parts by weight of hydrochloric acid.

There are other forms of local action which amalgamation does not prevent. Some of these will be more specifically described in connection with the types of batteries most unfavorably affected by them.

The zinc of a battery should always be amalgamated when the exciting liquid is acid.

THE EFFECT OF AMALGAMATION.

The action of the amalgam appears to bring the pure zinc to the surface of the negative electrode. Amalgamated zinc, therefore, acts like pure zinc; foreign bodies, as soon as they are dislodged, falling to the bottom of the cell, and wasteful action, due to local currents, thus avoided. But amalgamated zinc possesses the singular property of not being attacked when immersed in dilute sulphuric acid. Since this is equally true of pure and commercial zinc, the exemption of amalgamated zinc from attack is not due to the suppression of local currents. The following facts tend to show that the protection of zinc is to be ascribed to the adhesion of a film of hydrogen to the amalgamated surface.

When amalgamated zinc is plunged in water, acidulated with one-twentieth of its volume of sulphuric acid, it is not attacked at ordinary atmospheric pressure. But if a vacuum is produced above the liquid, bubbles of hydrogen are again freely given off from the zinc surface. Upon readmission of the air, bubbles again adhere to the plate, and the chemical action is arrested.

If two plates of ordinary zinc, one amalgamated and the other not, are immersed in dilute acid, the amalgamated zinc comports itself as the zinc, and the other as the copper, of a simple voltaic couple. The amalgamated zinc is thus more readily attacked by the acid than the unamalgamated.

With pure electrolytic zinc and neutralized sulphate of zinc, there is no potential difference between two plates of these materials one of which may be amalgamated and the other not.

Relative protection of alloying and amalgamating. The investigations of Reynier show that the protection secured by mercury is much greater than is generally supposed. In certain liquids the local waste of amalgamated zinc is 50, 100, and even 10,000 times less than that of ordinary zinc.

A further question is the relative value of alloying with mercury as compared with amalgamating on the surface. Reynier concludes that zinc alloyed with mercury is, in general, better than zinc amalgamated, especially in experiments of long duration.

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The first superficial layer of amalgamated zinc is rich in mercury; but, as the deeper layers are attacked, the proportion of mercury diminishes, and also the protection obtained. The reverse action takes place with the alloy, which is visibly enriched in mercury as its weight diminishes. It is evident that on closed current the superiority of the alloy shows itself after a much shorter time. The alloys are more brittle than the amalgamated zinc, and they become more so by use; a fact confirming the preceding observation.

The utility of amalgamating the zinc in batteries of the Daniell type has often been contested. Experiment demonstrated that the mercury reduces the loss by one-half in a solution of fifteen per cent sulphate of copper.

In the alloys referred to the mercury constituted four per cent of the entire mass.

In a chromic solution, as in a Fuller cell, amalgamated zinc soon loses its brightness, and takes on a dark tint, while the alloy becomes brighter and brighter up to complete exhaustion.

The employment of zinc alloys contributes to the economy of batteries, and increases their constancy.

Batteries of today differ from the fact that in most cases carbon is substituted instead of copper. In a carbon cell the positive electrodes are made of gas carbon made in the heated retorts in the preparation of gas. This substance has a very good conducting power, and it is very porous. On account of this porosity the electrode presents a considerable surface to the action of the solution and is very slowly polarized.

It is of great advantage to give the largest surface possible to the conducting electrode from which hydrogen is given off. The method that we have given to show the progress of polarization in a battery cell proves the superiority of a battery with carbon electrodes over that of voltaic cell of equal dimensions.

The zinc may be placed between two plates of carbon, or, better still, in the center of a hollow cylinder of carbon, always having in view the increase of surface.

When carbon electrodes have simple geometrical forms, or when they are simply plates more or less thick and wide, they may be easily cut from the residue in gas retorts, and that is what is generally done.

But if they are cylindrical, and especially hollow cylinders like that shown in Fig. 3, the above process can not be applied. The electrodes must be produced artificially in molds, by pressing powdered carbon with proper cements.

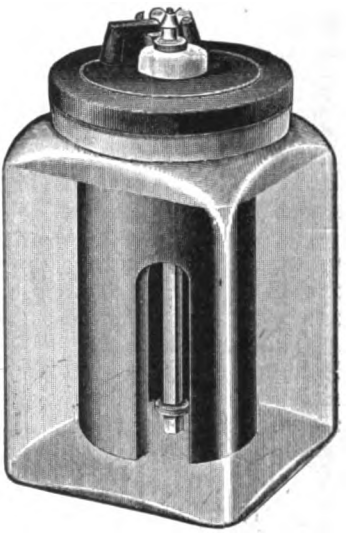

FIG. 3.

Bunsen suggests the following process to make carbon: A mixture of one part by weight of coal and two of coke is made (both having been reduced to an impalpable powder), which, placed in a sheet-iron mold, is heated to clear red until all gases have been given off. The carbon is then dipped in molasses and left to calcinate in a dry kiln or oven protected from the air.

John T. Sprague, of Birmingham, recommends the following process: "Plates or blocks may be built up from powdered graphite mixed up with coal-tar or strong rice-paste into a stiff dough, which should be dried, heated, then packed in powdered carbon in a closed vessel and heated to clear red for some time. When cool they should be soaked in strong syrup of sugar, or treacle, again dried and treated as be-

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fore; this process must be repeated until the carbon is perfectly dense and strong."

The chief difficulty with carbon is in making the connection. The contact between the carbon and the metallic binding post, by which it is connected with the adjoining cell or with the circuit, must be perfect.

This is commonly done by fixing a clamp on the carbon plate to which the binding post is attached.

A better plan is to deposit copper on the upper part and then solder the connection to it, as this gives continuous circuit. There is one drawback, however; the acid is soaked by capillary action into the pores of the carbon, reaches the surface of the carbon and the inner surface of the copper, which it attacks, thus destroying the connection. It is easy to avoid this action by immersing the upper part of the carbon in melted paraffin. The pores of the immersed part are thus filled by the paraffin, which, when left to cool, becomes solid. All capillary action thru the upper part of the carbon is thus prevented.

The top of the carbon may also be immersed in melted zinc. But by capillarity the liquid can ascend and attack the zinc as it did the copper. The sulphate of zinc would present the same difficulties as the sulphate of copper, and it is also desirable in this case to dip the upper part of the carbon in paraffin. The experiment shows that paraffin does not affect the conductivity of the carbon, and that the resistance of the battery is not increased by this addition.

Lead may also be deposited upon the top of the carbon, but here the paraffin is indispensable, because the formation of sulphate of lead is enough to diminish considerably the intensity of the current by introducing in the circuit a matter almost without conductivity and nearly insoluble.

All the cells in use today are formed of two electrodes which are immersed in a liquid, presenting one immense drawback; namely, their action decreases very rapidly with use and the current is constantly diminishing.

The causes of this decrease are twofold: The first is the loss of acid from the dilution. It may be easily understood that water acidulated in the proportions of 1 to 100 will act less energetically than water acidulated in the proportions of 1 to 10. This cause of the weakening of the battery is not felt until the expiration of a certain time, and it is easily avoided by adding from time to time, acid to the solution. The second is the deposit of hydrogen upon the copper. If the current be interrupted during a length of time sufficient for the freeing of the hydrogen, it will be seen that, as soon as the circuit is again closed, the voltage assumes its original intensity. Interrupting the current has the same effect as if you should agitate the plate of copper in order to cause the gas to free itself and to give to the current its initial intensity.

Constant batteries are those in which this second cause of weakening, called polarization of the electrode, is removed. The presence of the hydrogen upon the electrode opposes a double resistance to the passage of the current, a passive resistance and an active resistance.

It is the latter that is properly called polarization of the electrode. To depolarize the electrode, is to provide against these resistances.

It is very important to comprehend perfectly everything pertaining to this question; therein lies the whole difficulty concerning the improvements and perfecting of batteries. We will return to it in the course of our exposition.

Various reasons have combined to designate the positive electrode as that which represents the negative pole of the cell (zinc, in Volta's battery); and negative electrode to be designated as that one which represents the positive pole (copper or platinum, in cells which have occupied us up to the present).

One of these reasons has been indicated above, which is, that the flow of current follows the liquid of the battery from the negative pole to the positive, thence out on the circuit, which is completed by the flow of current thru the circuit to the negative pole.

We find in Daniell's excellent book, "Introduction to Chemical Philosophy,"

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another denomination which ought to be employed more frequently than it is, because it presents the expression of a fact and does not depend upon theoretical ideas, which are always open to discussion.

He calls the generating electrodes, that one which plays a part in the chemical action; it is the zinc in the cell that we have considered.

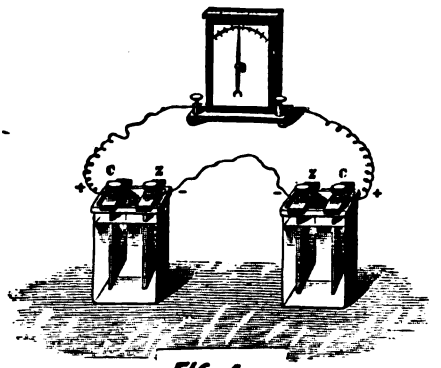

FIG. 4.

He calls the conducting electrode that one which is not attacked and which serves, however, to complete the cell.

The first can also be called soluble electrode.

An easy way to determine which is the positive and which the negative electrode of a cell is to attach a foot or two of wire to each binding post. Place the two free ends in a basin of water and the end which causes the water to bubble will be the negative pole.

In Fig. 4 we show how two batteries may be made to work in opposition to each other. In telephony, we very often have use for a group of batteries, and the proper method of connecting them together to meet the demands of the work they are to perform should always be considered. The metallic piece which connects the two zinc poles in Fig. 4 may be considered as the negative pole common to both cells, and the other is positive pole common to both cells. It may be observed that the two cells ought to produce the same effect as a single one in which the electrodes would have a double surface, while the distance between them would remain the same. The internal resistance offered by the two cells is only half of that offered by each cell alone, while the voltage remains the same. This may be demonstrated by placing a third cell of the same size and kind in opposition to these two cells joined in parallel, as in Fig. 4. There is another method of joining cells by uniting them for intensity. This consists in uniting the positive pole of one of the cells to the negative pole of the other. In this arrangement the electromotive force taken together is double that of each separately; the resistance is also double. Let us take, for instance, four cells, and join them as in Fig. 5, and let E stand for the force of one cell, and R for the resistance of one cell, and when they are joined as in Fig. 5 the E. M. F. will equal E × 4 and the resistance will equal R × 4. This example can be adapted to fit any case, and the method of joining these batteries, as in Fig. 5, is called connecting them in series. If they be connected in multiple or what is commonly called parallel, as in Fig. 6, the E. M. F. will be E × 1 and the resistance will be R × 1-6. If they are

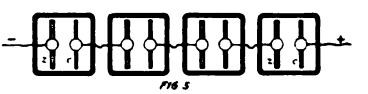

FIG 5

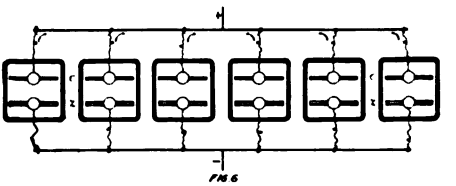

FIG 6

connected in pairs, and the three pairs connected in parallel as in Fig. 7, the E. M. F. will be E × 2 and the resistance will be R × ⅓. They may be connected by threes in series, and these two sets of threes connected in multiple as in Fig. 8. The E. M. F. will then be E × 3 and the resistance R × 3.

So long, as in this last combination, as there is no connection with any outside circuit, the three cells on the right are in opposition to the three on the left.

It is not necessary for us to insist longer upon this subject, or to make

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calculations which are indeed very simple, to make the reader understand that, with a sufficient number of cells, a battery may be obtained whose electromotive force will be as great, and whose resistance will be as little, as can be desired.

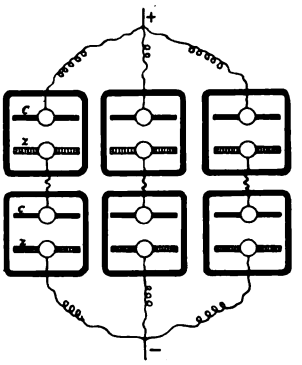

FIG. 7.

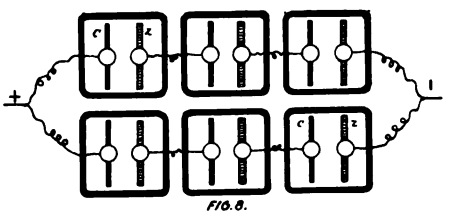

FIG. 8.

In most applications, and notably in the electric telegraph, there is only the need of increasing the electromotive force, and very little attention is paid to the resistance.

In certain instances, however, too great a resistance would be very detrimental; it is then that the cells may be joined in quantity. In practice, large cells having a very slight internal resistance are employed.

Owing to the number of additions that have been made to the battery paper we are compelled to continue it.

(To be continued.)

DISCOURAGING TO INVENTORS.

A peculiar feature of the German patent law is that it makes no provision for the employes of a manufacturer. If a workman in a German shop sees any point where an improvement can be made, whether in a machine or process, and has the same patented, his patent becomes the property of his employer without compensation.

THE "KEYSTONE" COMPANY.

Keystone State Telephone and Telegraph Company has been incorporated under the laws of the State of New Jersey, with a capital of $2,000,000, and has made an arrangement with the Keystone Telephone Company to handle all of their toll-line and long-distance business in and out of Philadelphia.

The officers of the Keystone State Telephone and Telegraph Company are as follows: C. E. Wilson, president; W. W. Wharton, secretary and treasurer.

The directors are as follows: W. H. Clark, C. E. Wilson, Edward Foerderer, George Kessler, Norman Grey.

The present offices of the company are in suite No. 750 Drexel building, Philadelphia. They will remove to the Keystone Telephone Company's building at Second and Sansom streets early in May.

The Keystone Telephone Company is progressing very rapidly with the work on its new exchanges. The company has secured properties for the two main exchanges, purchased the ducts formerly owned by the Standard Telephone Company, purchased conduit and has let contracts for switchboard. The contracts for constructing the subway work are let. The management reports that they are much gratified with the way contracts for service are constantly coming in.

ANNEALING STEEL.

Steel in the form of plates, wire or small articles can be annealed by placing the steel in a wood fire, preferably on the ground, heat the steel to a cherry red, and keep it at that point for half an hour; then cover the fire with earth and leave until cold, when it will drill as easily as wrought iron. Old files may be softened in the same way.

A NEW TELEPHONE LINE.

The Felix, Iowa, correspondent of the Grundy Center *Republican*, gives the interesting news item that Foster Brothers have a local mutual telephone reaching from their barn to the house, made out of carpet warp and cigar boxes, over which they can talk quite distinctly.

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WIRELESSNESS.

BY EDWARD J. WAKEMAN.

SLABY.

The power of the waves to break down the resistance of the coherer can be very much increased by the use of this exceedingly simple device. The multiplicator is simply a small choking coil interposed between the end of the extension wire and the coherer. It is necessary, however, that this coil should be tuned to the same frequency as the waves in the conductor to which it is connected. Slaby has proved by experiment that the multiplicator may increase the potential difference at the end of the extension wire as much as ten times.

We herewith give a diagram of the multiplicator in connection with the receiving wire and the coherer, which is self-explanatory and which seems to demonstrate Pupin's discovery of wave impedance thru a choke coil.

Tuning the electric waves in the transmitting and receiving conductors has been attempted by making the product of their capacity and self-induction equal. Under these conditions, the frequency of the electric waves generated in each conductor will be the same. Slaby has attacked the problem from a different standpoint, namely, by investigating the form of the electric wave in the vertical conductor and determining its nodal points. He found that the alternating potentials were not uniformly distributed thruout a vertical conductor connected to earth, but increased toward the top of the wire.

A mechanical similarity is that of a vibrating steel wire fixed at one end in a vise. When an elastic wire so fixed, is struck sharply, the end of the wire fixed in the vise is a nodal point, and the free end of the wire gives the maximum amplitude of vibration.

If the electric waves in a vertical conductor connected to earth are of the same nature as the vibrations in the steel wire so arranged, then the earth should be a nodal point with no variation of potential, and the maximum variation of potential should be at the upper end of the wire. Practical deduction indicates that the coherer should not be placed on the conductor anywhere near the earth connection, as has been the almost universal practice, but rather at the top of the wire. But it is evidently inconvenient to have the coherer fixed at the top of the wire, and Professor Slaby has ingeniously got over this difficulty by a method suggested in an extension of his mechanical demonstration.

If the straight steel wire is bent into L-shape with two equal limbs, and the corner is fixed in the vise, then vibrations produced in one limb will be transmitted thru the nodal point in the vise to the other limb, in which they will be exactly reproduced owing to its length and natural time of vibration being the same. Applying this to the electric waves, all that is necessary to get a point of maximum potential variation in an accessible position is to connect a horizontal wire of equal length to the vertical conductor where it makes connection with the earth. The free end of the horizontal wire is then a point of maximum potential variation, and here the coherer is connected.

Slaby believes that the present practice of placing the coherer near the earth connection of the vertical conductor has only succeeded because of the imperfections of the apparatus used. The length of the receiving wire in ordinary tests does not always happen to be exactly one-fourth of the wave length, as it should be, and the earth connection is consequently not a true nodal point; besides the transmitting apparatus usually employed sends out auxiliary waves which produce variations of potential. This seems to be the cause of many unaccountable failures in experimenting with the ordinary wireless telegraphic apparatus.

Slaby shows that the extension wire for making connection with coherers need not be necessarily straight, and he winds it on reels. His arrangement so heightens the effect of the waves on the coherer that vertical conductors without any special insulation, such as flagstaffs, iron masts, and lightning rods, may be used, and it is readily seen that by Slaby's method of tuning the receiving wire only waves of a definite length affect the coherer.

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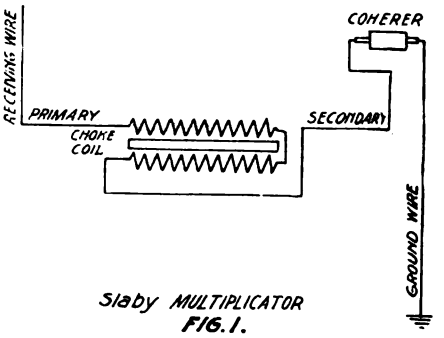
If the receiving wire is exactly equal to one-quarter of a wave length, or any multiple of its length, then all other waves for which the earth connection is not a nodal point pass freely into the earth, and the apparatus is practically insulated from these waves. The waves for which the earth connection is a nodal point create corresponding waves in the horizontal wire which leads to the coherer. The coherer is therefore affected only by waves of a length which the vertical conductor is adapted to receive.

It would appear at first sight that, with a given receiving wire, only one kind of waves could be received, unless elaborate apparatus for raising and lowering the vertical conductor was used; but Professor Slaby has made a remarkable discovery by which almost any length of wave striking a vertical conductor can be caused to act upon a coherer. In other words, each length of wave can be focused on one coherer without affecting other coherers connected up to the same vertical conductor.

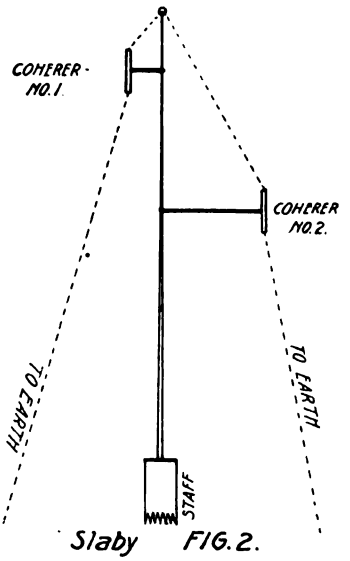
It will be seen from diagram (Fig. 2) of two coherers placed on one staff, for illustration, that a wave having a length tuned to reach coherer No. 1 from earth would not affect coherer No. 2, and a wave of a length that would only reach coherer No. 2 would not affect coherer No. 1, and that varying waves would only complete the circuit to which they were attuned.

The inventor does not profess to fully understand its theory, but he considers that it probably acts as a sounding-board acts to a tuning-fork. The London *Electrical Engineer,* however, takes issue with the learned professor, and thinks his views as to theory and action of the sounding-board of a tuning-fork are erroneous. It says, for instance, that "Slaby states that the vibrating prongs of a tuning-fork are more quickly damped, or come sooner to rest, when the fork is not in contact without a sounding-board, than when the converse is the case. It can easily be shown by experiment that this is the reverse of the truth. Starting with these erroneous premises, he explains the action of the sounding-board by saying that the vibrations of the fork are transferred to another medium whose vibrations are less damped, and are increased in amplitude. The usual, and, in our opinion, correct theory of the sounding-board is its larger surface prevents the air flowing away in currents, and thereby insures the conversion of a larger proportion of the vibration energy into sound waves in the air. The true analog to



Slaby MULTIPLICATOR
FIG. 1.

the multiplicator is not the sounding-board, but the heavy pendulum which is set into violent vibration by a sufficient number of exceedingly small synchronous impulses. The self-induction



Slaby FIG. 2.

of the coil corresponds to the mass of the pendulum bob, and the natural frequency of the electric vibrations in the coil is the same as that of the electric waves in the wire to which it is connected. The energy of many impulses

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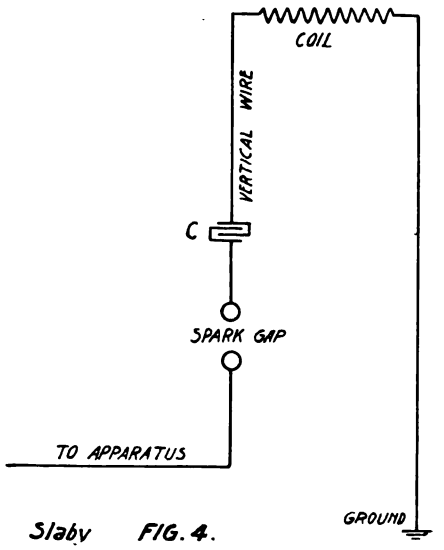
in the wire is stored up in the ever-increasing swing of the magnetic field of the coil, till the E. M. F. acting on the coherer is multiplied, as we have seen, in some cases as much as tenfold."

The receiving apparatus formerly used by Professor Slaby is shown on the opposite page, but his new sending or transmitting apparatus has several points of novelty. The object aimed at was to get the maximum possible amount of energy into the electric waves generated by the apparatus. For this purpose not only is a high tension necessary, but also a large quantity of electricity. Instead of a single insulated wire, as in the Marconi apparatus, a loop connected to ground, as in Fig. 4, is used. While the tension in the spark



Slaby FIG. 4.

gap is rising, the condenser C is charged thru the ground wire G, the coil and the vertical wire. As soon as the spark passes thru the gap, the condenser discharges into the vertical wire, but the waves generated in the vertical wire are not able to pass thru the coil, because the natural frequency of electric oscillations in the coil is not in tune with the frequency of the waves in the vertical wire. These waves thus have the advantage of carrying the large quantity of electricity stored in the condenser.

The length of the waves sent out are completely determined by the length of the vertical conductor and the capacity of the condenser. The wave length may be changed as required by interposing tuned coils in the conductor, the electric inertia of which reduces the frequency.

Professor Slaby is now making a complete new set of sending and receiving apparatus and promises a full and detailed description in his next lecture.

MAICHE.

M. Maiche, a well-known French electrician, has just constructed a wireless telephone. He recently tried the invention successfully in the woods of St. Germain. The transmitting apparatus was placed in a house on the outskirts of the forest. It communicated with the earth by means of a metallic cable, described as similar to the chain of a lightning conductor, which was driven a certain depth in the ground. About half a mile away in the woods two iron posts, connected by a conducting wire, were planted in the ground ninety feet apart, a damp spot being preferably chosen. To one of these posts was attached an ordinary telephone receiver. The voice of a man speaking into the transmitting apparatus at the house was then distinctly heard. The ticking sound of a special instrument, consisting of clockwork moving a needle which struck a bath of mercury, was also clearly perceived.

M. Maiche has not disclosed the secret of his invention. He states, however, that the communication in his wireless telephone is established, not as in the case of the Marconi wireless telegraph, by a wave current, but by a circuit current. The importance of this fact is understood when it is explained that M. Maiche in some manner is able to direct the current traveling in a straight line from the transmitting apparatus, and, as it were, to aim at a given spot.

If the receiver is not placed exactly in the direction given to the current, no transmission is obtained. Receivers placed on either side of the line followed by the current are not in any way affected by the latter.

As yet M. Maiche has not been able to transmit messages over a distance of more than one thousand yards, but ex-

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pects to do better, and he states he will give us later a résumé of his experiments, illustrating his apparatus.

The decision of the English Admiralty with regard to utilizing wireless telegraphy for naval signaling, testifies to the fact that the English Government has fully recognized the value of this system of signaling. Stations for this purpose are to be established, it has now been decided, at Culver Cliff, Dover, Portland Bill, Rame Head, Roche Point, Scilly Isles, Gibraltar and Malta. These two latter stations will, of course, be for use in connection with the Mediterranean and Channel fleets. As to the English stations, Culver Cliff is to be in direct communication with Portsmouth and Rame Head with Plymouth. By these means the naval commanders-in-chief at these ports may receive rapid and continuous information of what is happening in the outlying portions of their command. Special staffs for peace and war will be allocated to each station.

In our own country, the Navy Department for some time has been giving careful attention to the subject of wireless telegraphy with a view to ascertaining how far it may be practically applied to the naval service. The subject has now advanced to the point where Secretary Long has appointed a special board of officers to make a thoro inquiry on the subject. The board consists of Captain Chadwick, Lieutenant Powelson and Lieutenant-Commander Hodgson.

The meetings of these officers will take place at Newport and it is expected that their conclusions will determine to what extent the wireless system can be utilized for the navy. It is the purpose of Secretary Long to have the entire subject gone into, with a view to devel-

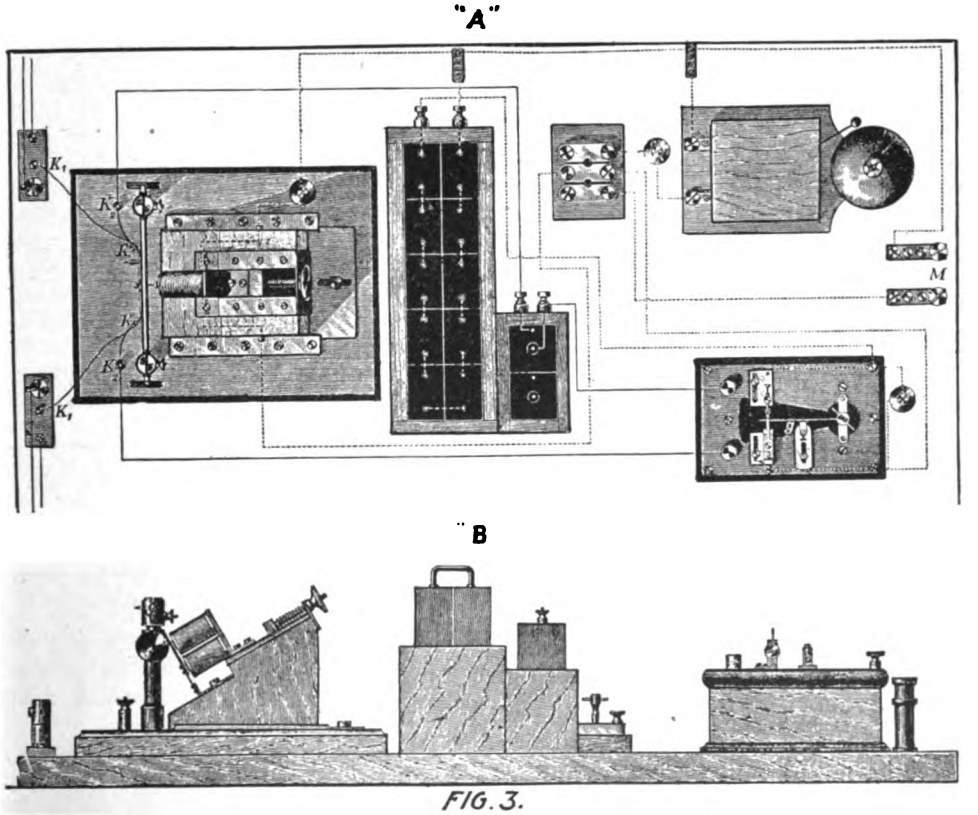

FIG. 3.

A is a view of Slaby's receiving apparatus, with call bell rung by relay, with Morse instrument joined on the terminals and together with the switch to change from calling to signaling. K, K are the terminals of elevated wire and earth, and the co-hearer and the tapper back are mounted on the same base. B, an elevation of the same apparatus, shows the electromagnet and hammer of the tapper back, worked from relay current from local battery.

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oping not only the practical utility of the Marconi system, but of all others which may be available for naval uses.

Prof. Willis L. Moore, head of the United States Weather Bureau, has made an official inspection of the wireless telegraphy stations in Virginia and North Carolina, and has reported to Secretary Wilson the results of his observations. He found that the experimental work is progressing satisfactorily between Hatteras and Cape Henry, where elaborate plans have been laid out for important experiments.

At Cape Henry an excellent plant has been established for the physical and mechanical development and investigation of the fundamental principles of wireless telegraphy. Signals are being exchanged daily between these two stations, and messages can be transmitted at any time, tho there is no necessity for exchange of messages as yet. These two stations are forty-seven miles apart, with no land between them, and the course is regarded as an ideal one for the experiments. It is intended to keep this section for experimental and research work which will be prosecuted vigorously thruout next summer.

The next great problem to be solved, according to Chief Moore, is the differentiation of the wireless message so that the message sent shall be read only by the stations for which they are intended and not interfered with by the crossing of messages for other stations.

The Wireless Telegraphy Company, of Honolulu, Hawaiian Islands, is now publicly advertising that it will receive messages for transmission by the Marconi system between Honolulu and its stations on the islands of Molokai, Lanai and Maui.

All this indicates that practical wireless telegraphy and telephony is being rapidly developed, so rapidly indeed that it is hard to keep posted in its wonderful growth.

Judge Cox, of the United States Circuit Court, has rendered his decision in the Marconi-Dolbear infringement suit to the effect that there is no similarity between the two methods or the appliances for effecting the transmissions.

(To be continued.)

KENTUCKY SALES INVALID?

Since the Cumberland Telephone Company absorbed the East Tennessee Telephone Company it has purchased several Independent exchanges in Central Kentucky, and has endeavored to purchase several more which it has not been able to buy.

Under the constitution of Kentucky it is impossible for a common carrier to purchase a competing or parallel line.

Section 20 of the Constitution of Kentucky is as follows:

"COMMON CARRIER NOT TO CONSOLIDATE WITH OR PURCHASE PARALLEL LINE — CONTRACTS BETWEEN — WHEN FORBIDDEN.— No railroad, telegraph, telephone, bridge or common carrier company shall consolidate its capital stock, franchises or property, or pool its earnings, in whole or in part, with any other railroad, telegraph, telephone, bridge or common carrier company, owning a parallel or competing line or structure, or acquire by purchase, lease or otherwise any parallel or competing line or structure, or operate the same; nor shall any railroad company, or other common carrier, combine or make any contract with the owners of any vessel that leaves or makes port in this State, or with any common carrier by which combination or contract the earnings of one doing the carrying are to be shared by the other not doing the carrying."

This section of the Constitution has been sustained by the Court of Appeals of Kentucky and the United States Supreme Court in the case of the Commonwealth against the L. & N. R. R. The L. & N. bought the C. & O. and S. W. R. R., a competing line, and an action was brought to declare the sale void because it was in violation of the Constitution. It was held to be void by the Circuit Court; this decision was sustained by the Court of Appeals and that decision affirmed by the United States Supreme Court, to which court the L. & N. carried the case.

The Cumberland is a Bell Company which proposes to combine as many of the exchanges thruout Kentucky as may be purchased to be merged in the American Telephone & Telegraph Company.

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Telephone Magazine

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Published on the 1st day of each month.

ELECTRICAL ENGINEERING PUBLISHING CO.

JOHN C. McMYNN, PRESIDENT.

No corporation, firm or person either directly or indirectly interested in the production or sale of telephones or telephone materials of any sort has any connection, editorial or proprietary, with this publication.

To the Independent Builder.

Don't over-capitalize. It is the first signboard of public distrust. It is simply non-earning dead weight. Don't put the receipts of a bond issue in your pocket. The exchange can't stand it. You either rob yourself or the investors.

Beware of the error of trading good paying independent telephone stocks for bonds of paper companies who undertake to absorb independent companies, paying the fabulous prices in said bonds that have no more value than the paper on which they are printed. The only value some of these bond issues possess is the security on the underlying properties purchased. Take only the bonds you can sell on the open market, or, better yet, get the cash. If the buying proposition is represented by real and not paper capital, you can just as well have the money.

The Open-Air Telephone.

The newest thing in telephones is the open-air instrument. The idea is to drop a nickel in the instrument at the corner and save your time.

The device is the height and shape of a police or fire-alarm box, mounted on a five-foot iron post. The box bears the blue bell, the emblem of the telephone pay station. The door is unlocked with a nickel, which is again used to get central. At first sight this looks like a good thing, but the lack of privacy, the inconvenience to ladies, the division of your conversation with the public and the exposure to the weather count against it. The distribution of pay stations in the stores and hotels will not be preceded by the new idea. Imagine a warm declaration of love on a cold day thru an open-air 'phone, with the volunteer advice of the street gamin assailing your frozen face. Would you? For a nickel? We think not.

A Mental Anguish Bill.

Sam Peterson is a thinking chap. He lives under his hat up in the Minnesota Legislature, when he isn't home cutting hay. Sam's think microbes got experimenting on wireless signals, and under the consequent wave impulses he

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evolved a mental anguish bill. The bill itself is nothing. It simply assesses $300 damages for each failure of a telegraph company to promptly deliver a message. But the mental anguish — that is what bothered Sam. This perhaps is hereditary. It is said that Sam's mother always asked his father at the wrong time if he had remembered to let out the cat. Mental anguish grew up with Sam. No wonder he telegraphically figured it at $300 per. Telephonically, it comes cheaper. It is a common property of operator and subscriber alike, and may frequently be even classed as a Bell asset. We hope if Sam projects a similar telephone bill, that he assess damages for failure to promptly transmit messages at about 30 cents per.

The Day of the Telegraph Is Past.

Vice-President Clark, of the Western Union Telegraph Company, testified before the Industrial Commission that the present rates for telegraphic dispatches are as reasonable as is consistent with good business management.

Analyzed, this means that the governments of Europe owning telegraphic lines sell their telegraphic service for less money than will support dividends on a large capitalization.

In Europe the Governments create the values. In America the public pays the dividends on the values it creates.

It was admitted before the commission that the Western Union and the Postal Telegraph Companies have a working agreement to maintain present rates. This makes a telegraph monopoly. Except — telephonic competition. The day of the telegraph has passed. The American public, creating telegraphic values, will, in the development of the use of the long-distance telephone toll system, reduce the telegraphic and increase the value of the telephonic investment.

The New Patent Commissioner.

Frederick I. Allen, the newly appointed Commissioner of Patents, will have a hard road to travel before he is confirmed by the senate.

The mere fact that for years he has been identified with the Empire State N. Y. Bell Telephone Company has aroused the opposition of every independent company in the country. From Seattle, Chicago, Kansas City, St. Louis, Indianapolis, Pittsburg and New York have been sent independent protests against the confirmation of Mr. Allen, and these protests are vigorously backed up by business men of strong political influence.

Mr. Allen should make a straight showing to the independent interests opposed to the Bell monoply, proving that he is not and will not be controlled wholly or in part by the Bell people, before he secures the indorsement of the senate.

LECTURE OVER 'PHONE.

Rev. C. M. Sheldon made an address Thursday night over the long-distance telephone to the Men's Union of the Prospect Avenue Church of Kansas City, Mo. The occasion was the second annual meeting and dinner of the Union. His subject was, "Some Ways of Making a Better World." Every word could be distinctly heard in Kansas City. Each diner was provided with a separate receiver and previous to Mr. Sheldon's address they were entertained by music given over the line.

COMPLIMENTARY.

Do you publish anything as interesting to Bell men as THE TELEPHONE MAGAZINE is to the Independents? I take it, but it's too confounded "Independent," to my notion. J. J. GRAF.

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TALKS AND CROSS-TALKS.

BY A. E. DOBBS.

HINTS TO CORRESPONDENTS.

Write on one side of the paper only, and make sketch or diagram, when necessary. Endeavor to give all the facts bearing on the case, so as to enable the editor to answer intelligently.

Name and address must accompany each letter, not for publication, but for the information of the publisher.

DUTIES OF EXCHANGE OFFICERS.

106. What are the duties of the trouble clerk or chief inspector, as he is sometimes called?

The duties of the various officers of an exchange are generally defined by the constitution and by-laws of the company, but generally they may be defined as follows:

President.—Looks after the financial affairs of the company and has a general supervision of everything; presides at all meetings and carries out the orders of the board of directors; and in some cases, especially if he holds the majority of the stock, the principal director himself. He gives his orders thru the heads of the different departments. All reports of the different departments are made to him, as well as to the board of directors.

General Manager. — Has general supervision of all the departments, and assists the president by looking after the financial affairs of the company, and in some cases attends to all of the detail work of the various departments in a general way, all reports being made to him and material and supplies ordered thru him. The bookkeeping department belongs to him.

Exchange Manager. — Has supervision of the workings of the exchange, including in a general way the operators thru the chief operator. Has general charge of inspectors and troublemen and sometimes all "order" construction, which includes the placing of new instruments and ordering of supplies for his department. In some cases his duties also include the testing of lines, cables, and general supervision of the maintenance department. His department sometimes includes a report in all troubles and their nature, and reports on the general condition of the lines.

Superintendent.—His duties are to take charge of all construction work and carry out the orders of the manager. He should also be familiar with the condition of all lines and cables, but as a general thing has nothing to do with the operators. He also hires and discharges all men in his department. Sometimes his duties also include those of exchange manager, in which case he takes over that officer's duties.

Foreman of Construction.—Just what his name indicates he is, really an assistant superintendent, and in some cases hires and discharges his own men, tho often contenting himself with sending them to the superintendent for that purpose.

Chief Operator.— Has charge of all the operators, in some cases hiring and discharging them at will, tho generally referring that to the exchange manager or superintendent. Sometimes also acts as trouble clerk and has a certain supervision over the troublemen and keeps records of all troubles. In small exchanges looks after the toll business, and in any case this is under her charge. Sometimes takes her turn at the board to relieve the operators temporarily.

Engineer.— Has the planning of all construction and exchange work; laying out lines; specifying and passing on all material used; plans the construction and equipment of the exchange, and tests all lines and controls all necessary testing instruments. His duties are sometimes combined with that of superintendent. He is responsible for the perfect operation of the equipment when placed. He is responsible only to the president and board of directors, and during construction, superintendents,

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foremen and inspectors must execute his plans. Lacking technical information themselves, the directors depend upon him for information as to work in his department, which he should always have at hand. During construction, he may be assisted by one or more inspectors.

Chief Inspector.— In the maintenance department this official is really a wire chief and has charge of all wiremen and troublemen. Lays out all house wiring, has supervision of all contract work in an advisory way, and keeps a lookout for anything needful to increase the efficiency or improve the service. Sometimes has charge of cable and line testing and all necessary instruments. In some cases has his men to make tests of all trouble (or does it himself) reported to ascertain its direction from the distributing board. If there is an engineer he works in conjunction with him; if not, he is responsible to the manager.

Trouble Clerk.—As his name indicates, he works under the chief inspector. He records and makes tests in all cases of trouble and verifies the troubleman's report that everything is "all right"; assigns the troubles to the different men as they are turned in by the chief operator, and has tests made to ascertain the direction of the trouble from the inside cable terminals or distributing board. Keeps records of all wires and cable numbers and supplies all needed information as to cable numbers and wire records to the troublemen to enable them to do their work readily. His only authority is to report men who can not do their work to the superintendent or chief inspector. His only instruments are a set of test telephones, the cable testing and galvanometer work being done by the engineer or inspector.

A LETTER FROM VENEZUELA.

107. CARACAS, February 8, 1901.

DEAR SIR,— Kindly tell me in your "Talks and Cross-Talks" whether telephones used in central-energy systems are equipped with induction coils, or does this system do away with them? I have not been able to settle this point from the many excellent articles which have appeared in your magazine.

E. H. LUDFORD.

It all depends on the circuit. In some systems there is an inverted induction coil used at the subscriber's station as shown in Fig. 1, in which the receiver is placed in a secondary winding which thus forms simply a closed local circuit. In this case, of course, the secondary coil is not in the line circuit at all, which is the very reverse of that used in local battery practice.

In Fig. 2, which is the circuit commonly used by the Western Electric Company, the induction coil at the subscriber's station is omitted, tho not always, and a repeating coil at the central office takes its place.

In both the above figures the letters *P* and *S* mean primary and secondary coils.

In Fig. 2, however, the terms primary and secondary are apt to be misleading, as both windings are about equal; they should be exactly so; and therefore either side may be primary or secondary according to the direction from which the original impulses come. In some

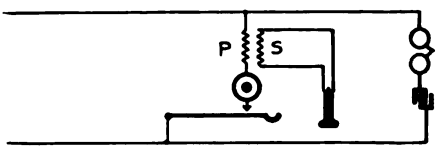

FIG. 1.

systems the shorter lines have a choke coil placed in series with the transmitter in order to prevent its receiving too much battery. Look at our Patent Digest and read the drawings.

108. We propose to build a toll line for a distance of nearly eight miles, and owing to cross-talk we think of building out from the exchange C for a distance of one and a half miles as a metallic circuit, and putting in a repeating coil at B, running the rest of the way as a grounded line. As shown by the figure, there are two grounded and one long-distance metallic lines on the same lead, and the cross-talk is very bad at present.

A. C. & S.

Your plan is a very good one so far as it goes and will no doubt be better than a straight grounded line.

But while you are about it, why don't you make the whole line metallic and so be sure of good service? You could get good talking and ringing service over a No. 12 steel wire and save the cost of a repeating coil, so that the additional

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outlay would be only about $15 or $20 more, with the additional advantage that the work is bound to be satisfactory if properly transposed.

It does not pay to go to more trouble to fix up inefficient work than it would cost to do the work properly at first.

109. Why will a bridging bell not ring when short-circuited at the binding posts?
L. T. P.

Because the ringer is in multiple with the line and generator as shown theoretically in Fig. 4. A minute's study of this figure will show that if there is a short circuit across the line as indicated by the dotted line, it will take about all the current and leave none for the ringers. Such a bell would ring quite loudly on an open circuit.

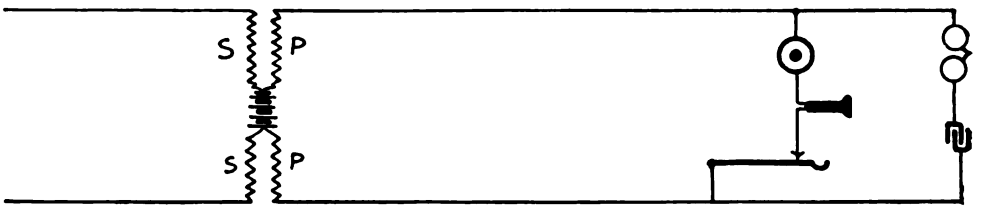

FIG. 2.

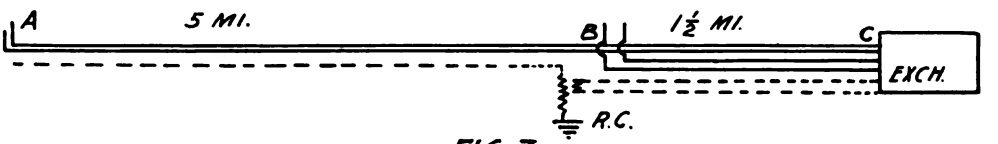

FIG. 3.

AN EASY ONE.

110. I have two cable numbers that are bothering me considerably. I can take a test set at the cable pole, connect it to both numbers, and it will ring "short," but will not go into the board. I can also do the same at the other end of the cable from the office. When, however, they are connected to the outside, and a subscriber rings in, both drops will fall; or ringing from the board out, both subscribers will answer. The system is common return. H. V. W.

We have illustrated this trouble in Fig. 5. Would any of our readers connect the two lines and use them as one line and take an idle cable line for the other drop? Or would they suggest another remedy for the trouble should all the cable lines be in use? Let us hear.

THERE ARE OTHERS IN THE SAME BOAT.

111. We have a 300-drop grounded system. Nearly all of our city ground connections are made to gas or water pipes, but about eight or nine of our lines outside of the city limits are connected to ground rods ¾-inch by 5 feet. In the summer, drops connected to these ground-rod lines will fall at times, and we will see the catch lift up and hold up for a second or two, or sometimes for an hour. We have a street railway system here of 550 volts and an electric light service of 3,000 volts. The drops are wound, I should judge, to about 60 ohms, and the ringers to about 80 ohms. The 'phones grounded to the gas and water pipes make us no trouble in this way, and as to the other lines we have been over them carefully and can find no grounds or leakage, and are at a loss to account for the trouble. C. J. W.

Your remarks about the trouble occurring in the summer time at first suggested to the Inspector that the trouble came from lightning discharges. But lightning does not hang on to a line continuously for an hour, and that leads to the suggestion that the trouble must

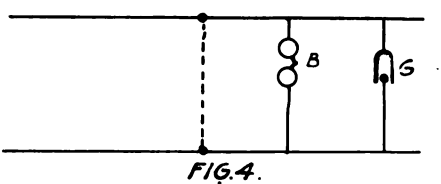

FIG. 4.

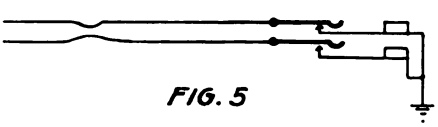

FIG. 5

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come from the railway system, which can best be determined by connecting a voltmeter in series with one of these troublesome lines, cutting it out from the board and connecting one side of the voltmeter to the line and the other to the ground wire. If it happens that there is a difference of potential between the gas and water pipe system and the earth outside, it will be shown on the voltmeter.

Use a low reading, or battery voltmeter for this purpose. Should you get a reading of two volts or more, it will indicate the cause of your trouble, in which case the only remedy is to run the ground wire back far enough to connect with the water system, or make the lines metallic circuits.

In order to comprehend this question more fully, let us suppose that the gas and water piping of the city is connected to the railway track at frequent intervals, as it should be, so that between the different systems of piping and also different parts of the city the potential difference is very small.

Now, all of the lines being connected to the pipes, we have what is practically a common-return system, with very low resistance in the return side, and which is laid in the ground instead of being strung overhead.

But this return side also carries the return trolley current, and as all of the lines are in multiple, all assist in returning this current to the power house.

If the bonding to track and pipes has been carefully done all of the lines get practically the same amount of this current, so that the leakage is hardly noticeable. For all that, however, there might be a considerable amount of current in these pipes and very little in the surrounding earth, especially those portions of the earth located quite a distance away from the tracks. In fact the difference might amount to several volts, which would be enough to throw the drops and give a very noisy service. In all cities this matter becomes a very annoying one to telephone companies and especially to those having a central battery system in which one side of the ringer is grounded. Even in those systems where there is no ground on the lines the current attacks cables and shortens the life of them very materially.

Cases have been known where this difference even between gas and water pipes was so great that people lighted their houses by connecting one leg of their circuit to a gas, and the other to a water pipe, and in other instances ring door bells without any other battery than the house piping.

The only remedy for this state of affairs is, to have the electric railway companies connect these pipes together at frequent intervals to the track return wire, or rail, so that there will be no drop in the voltage between the pipes and the track. This bonding should be extended to underground cables if they are used. There are also considerable differences of potential between different parts of the earth itself, which is one of the causes of noisy grounded toll lines. You will see an article in the TELEPHONE MAGAZINE next month on this subject.

MORE ANSWERS TO NO. 79.

In regard to question No. 79 in the March issue, correct replies have been received, as follows, from L. A. Starrett, Cleveland, Ohio:

112. I would suggest the following in reply to No. 79: Usually one receiver tip is marked with a small x, and this may be connected to either post, according to the wiring in the exchange. If there is no x-mark on the tip, or if you do not know the line connections at the exchange connection in the receiver and talk to the exchange, then reverse the connections and talk again. In one case the receiver will work better than it will in the other, and of course it should be left with the connections giving the best results.

The reason for this is as follows: Suppose the receiver to be connected so that the central battery opposes the receiver magnetism. It takes a good part of the battery current to neutralize the magnetism of the receiver, leaving but little magnetism to act on the diaphragm, and of course giving poor results. When the connections are changed, the central battery aids the magnetism of the receiver and gives normal results, as is shown by clear or loud talking.

From F. W. Gerny, Tempe, Arizona.

113. Fig. 14 (p. 248) is an answer to question 79. R is the receiver, either single or double pole: N is an ordinary sewing needle; T is a short piece of thread fastened thru eye of needle: S is position of needle when

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polarity of electromagnet is same as that of the permanent one, and O is the position it takes when opposite. To make test, connect the receiver in series with about three primary batteries. If direction of current on line is not known, of course that must be learned by aid of galvanometer or battery gauge. The receiver should not be so near needle as to make it possible for the needle to touch pole piece. The above is not deduced from theory alone, but was demonstrated by experiment.

From H. Clyde Snook, Xenia, Ohio.

114. Under "Talks and Cross-Talks," my answer to 79's puzzle is this: Do as the Central Union installers are instructed to determine the connections. After the instrument is hung, let one person remove the receiver cap and hold the diaphragm over the pole pieces of the receiver while another manipulates the hook switch and the receiver cord tips at the binding posts.

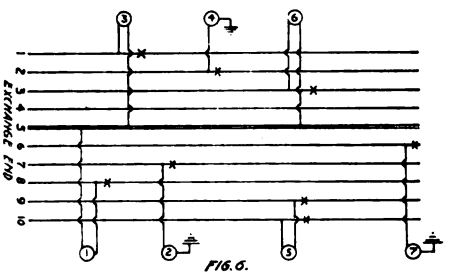

FIG. 6.

By reversing the positions of the tips in their binding posts, it will be found that the diaphragm will be pulled harder with the tips in their posts one way than the other. Of course, this does not reverse the direction of the current thru the microphone, but one can readily see that the tips are to be left in the position with which the diaphragm is attracted the more strongly, since in that position the magnetization due to the current increases the number of lines of force in the field, while in the other position it decreases them.

A CANADIAN SUGGESTION.

115. In the March issue in reply to question No. 86 the Inspector gave a solution to a bad plan of wiring shown as Fig. 4, and corrected in Fig. 5.

Mr. A. A. Owens, of Montreal, Canada, thinks he has a better solution and sends it in for comparison with the Inspector's plan. The marks X X show where the wires should be cut. His plan would leave the dead wire as No. 4 instead of No. 1, and put the metallic circuit on the outside pins.

R. H. J. sends in a number of questions in regard to repeating coils, but as the questions are purely hypothetical and of no practical value to anybody we can not take up space with them.

J. A. J. has a lead of twenty-four grounded lines and wants to know what he should do with them if a trolley line should be built on the opposite side of the road paralleling them for about two miles. Well, the Inspector would wait till the trolley road was built, and then, if he found the lines too noisy he would run out a No. 10 copper return wire and connect the telephones to that instead of to the ground.

FROM AN OLD ACQUAINTANCE.

116. The following letter from one of the brightest young managers in northern Ohio, will be found of considerable interest to many of our readers:

DEAR SIR,—I have hit upon a plan to "keep tabs" on my operators that may be of interest to other managers. I do not know of its being used elsewhere, but it works so well that I know it will be of interest to your readers. It is, in short, a monitor system, whereby I can take down the receiver at my house and hear all that goes on in the exchange room. This reduces the friendly chats and also has a tendency to keep the room free from visitors when the manager and chief operator are away.

Briefly it is as follows (Fig. 7): Let A represent the operator's induction coil. In series with this I insert a second coil B,

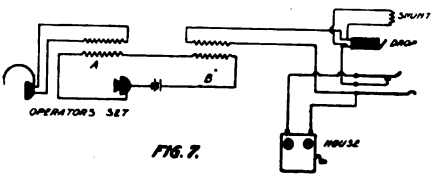

FIG. 7.

making two primary coils in the battery circuit. The secondary of the coil B is connected in series with the drop and line, and as the drop is an armored one of high impedance, insert a non-inductive shunt around so that for listening purposes it is out of the circuit.

We have ten operators' positions, and the fourth position is the one used for this connection. The insertion of a plug into my line jack, of course, cuts this coil out, and we can use the line in the usual manner.

Neither my ringing "central" nor taking down the receiver makes any noticeable disturbance in the operator's receiver.

My line, of course, is an absolutely quiet one, the 'phone being located about two hundred feet from the cable terminal and about half a mile from the exchange. Distance, of

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course, would cut no figure as long as the line is a quiet one.

It is possible to hear all that goes on whether the cam is open or closed. If open, you get the momentary talk of the party who is answering — a good thing, also, to prevent eavesdropping operators.

Its chief value, however, lies in the knowledge on the part of the operators that *I can listen in if I choose.* Therefore they are careful what they do and say.

I have used a number of ——— dry batteries and have no cause to regret doing so. The water we have here causes crystallization in the ordinary wet battery in from two to three months, while we have had the dry cells on telephones twelve, fourteen and eighteen months, according to the use they have, and I find it cheaper to use them and throw them away when run down than to try to keep up the wet cells.

I have also tried recharging these cells and find that I can bring them back from 0 to 1.3 volts with about four hours' charge of 1.5 amperes at 6 volts. These recharged cells appear to work well, but I have not carried the thing far enough to know about their lasting qualities.

E. G. MILLER,
Warren, Ohio.

HOW TO USE A WHEATSTONE BRIDGE.

117. One of our subscribers is having all kinds of trouble with a Wheatstone bridge that he purchased from the Western Electric Company, which refused to furnish him any information in regard to its use, taking it for granted that he should know these things for himself. This perhaps is well enough, for if a man has no idea of the use to which a bridge set is to be put, he should take a course of instruction before buying one. There are several text-books on testing; one of the most practical for ordinary purposes probably being Webb's "Hand Book on Testing," or if you are well up in mathematics there is a book by Kempe which is a good one. There is also a book by Munro and Jamison which covers all kinds of testing.

The principle governing a Wheatstone bridge depends on the relations that divided circuits bear to each other. If, for example, one path has a resistance of 10 ohms and another a resistance of 1,000 ohms there will be a ratio of 10 to 1,000, or one hundred times as much current in one path as in the other.

Now if we place a galvanometer in a circuit and pass a current thru it, the needle will swing to the right or to the left according to the direction of the current. If, however, we send a current thru it in two different directions at the same time the stronger path or the one of lower resistance will control the needle to that extent. However if we strike a balance so that the current

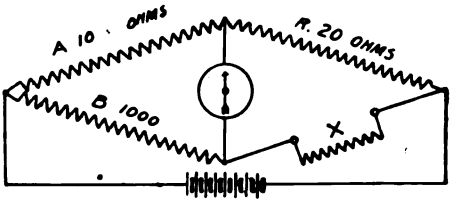

FIG. 8.
RANGE 100 TO 111000 OHMS

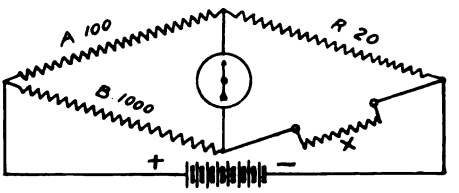

FIG. 9
RANGE 10 TO 11.100 OHMS.

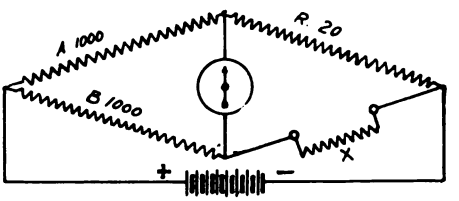

FIG. 10.
RANGE 1 TO 1,110 OHMS

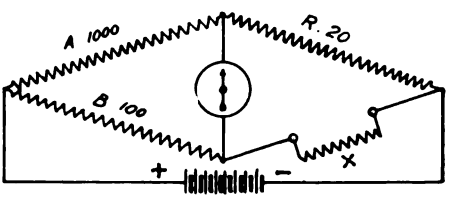

FIG. 11.
RANGE 1 TO 111 OHMS

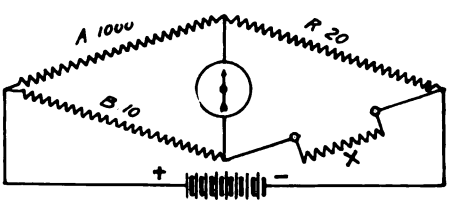

FIG. 12.
RANGE .01 TO 11.1 OHMS

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from both directions is equal, then the needle will be balanced between two opposing currents and stand at the center or zero point.

Fig. 8 is a theoretical diagram of a bridge as connected up for ordinary resistances. The current coming from the battery flows thru the galvanometer from two sides over the arms A and B, which are called the ratio arms. These arms need not be of equal resistances provided that the ratio is also kept up between the arms R and X. Now X is always the number to be found, and this is done by adjusting the arms A and B in the manner found by experience to give the best result, and adjusting the rheostat R (Fig. 8) until the needle of the galvanometer comes to zero.

In order to study the conditions more fully we will refer to Fig. 13, which represents a very popular form of bridge having a capacity of measuring 111,000 ohms. First we have the ratio arms A and B, which correspond to the theoretical diagram in Fig. 8, and a little study of the circuits shown will show the connection between the two.

A and B are sometimes called the short arms of the bridge.

In series with the arm A, is connected in the rheostat R, and, as will be seen by adding up the units, tens, and hundreds, it has a total resistance of 1,110 ohms. In bridges of larger caliber a fourth strip is often added for the thousands, thus giving the R arm a reading of 11,110 ohms and therefore increasing the range from .001 of an ohm to 1,111,000 ohms instead of from .01 to 111,000 ohms as in the present case. The measurements are always made by placing the plugs in the 10, 100 or 1,000 holes in the A and B arms, and shifting plugs in the rheostat (R) till the needle of the galvanometer comes to the center, when the ratio between A and B determines the resistance of X, which is the line, or other resistance to be measured.

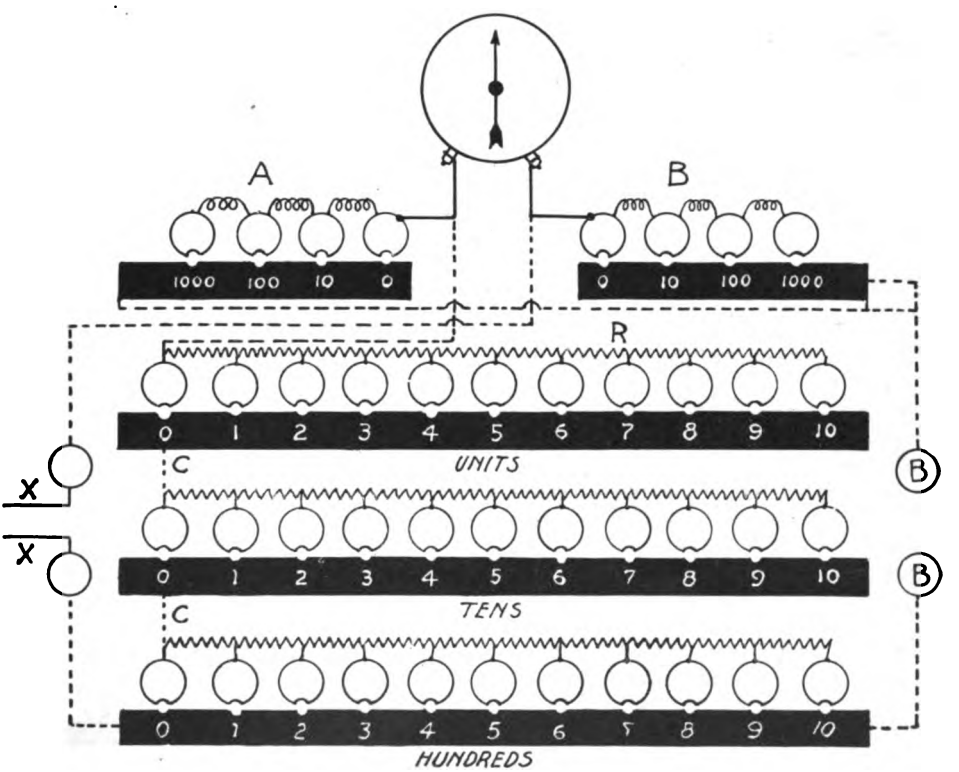

FIG. 13.

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A mistake sometimes made by young fellows who are having their first experience with a bridge is, that by placing the plug in the 0 position they will greatly increase the reading of the instrument; but, if they will look at the diagrams again they will see that plugging the 0 hole sends practically all the current thru the galvanometer in short circuit and therefore makes a reading ratio impossible.

In Fig. 8 we have 10 ohms in A, and 1,000 ohms in the B arm, and we get a balance at 20 ohms in R. As the arm B has a resistance 100 times greater than A, so in order to balance the unknown resistance X must therefore have a resistance 100 times greater than R. And, as R = 20, so X = 20 × 100 = 2,000 ohms.

With the A and B arms as above, it is thus possible to get a reading as low as 100 ohms and as high as 111,000 ohms, as already stated.

In Fig. 9 the ratio in the A arm has been changed so that the ratio is now 10 to 1, and the reading ratio in R changed accordingly, so that we have 20 × 10 = 200 ohms.

The reading range of the bridge in this position is from 10 to 11,100 ohms.

In Fig. 10 both arms of the bridge are equal and the plugs might as well be in the 100 or 10 holes, except that where a large number of cells are used it is better to insert a rather high resistance in order to prevent heating of the resistance coils.

The reading is just what the R plugs indicate, and the range is from 1 to 1,110 ohms.

In Fig. 11 it will be noticed that the ratio has been changed and that B no longer constitutes a multiplying, but a dividing factor and we have a ratio of 1-10 and the balance found at R therefore needs to be multiplied by .1, which is equivalent to dividing by 10 and 20 ohms in the rheostat arm, thus indicating 2 ohms as the value of X. Range of measurement from .1 to 111 ohms.

Fig. 12 is the ratio used for very small measurements and the multiplying factor is 10 to 1,000, the dividing factor 1-100. Using the latter, 20 ohms in the rheostat becomes .2 of an ohm as the value for X. Range .01 to 11.1 ohms.

RECAPITULATION.

It will thus be seen that when connected up in this manner our formula invariably is

$$\times = \frac{B}{A} \times R, \text{ or } \frac{B \times R}{A} = \times.$$

Make a copy of this formula and paste it in the cover of your box so that you will always have it with you.

The following ratios in the A and B arms will be found satisfactory as a general thing, tho it need not be followed absolutely. If the rheostat has a range of 10,000 ohms the measurements can of course be increased ten times the amount given below without changing the arms. The probable value of X should be considered and the ratio adjusted accordingly. The plugs can be changed in the ratio arms till the proper proportion has been found.

Probable value of X.	A arm.	B arm
10 ohms or less	1,000	10
110 ohms or less	1,000	100
1,100 ohms or less	1,000	1,000
11,000 ohms or less	100	1,000
111,000 ohms or less	10	1,000

There is one thing to be observed in working with the formula given above $\frac{B}{A} \times R$, and that is, that it is made up on the supposition that the rheostat R is connected in series with the A arm. If upon examination you should find it in series with the B arm, the formula would have to be reversed. This must also be kept in mind in reading textbooks on the subject.

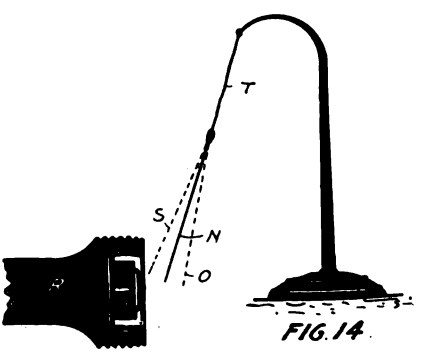

FIG. 14.

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WE HEAR FROM GERMANY.

HANOVER, March 18, 1901.

To the Telephone Magazine, Marquette building, Chicago:

118. DEAR SIRS,— By kindness of a friend of mine I just happen to get knowledge of the small article, "Some Inventors," reproduced under "Talks and Cross-Talks," in the November, 1900, issue of THE TELEPHONE MAGAZINE.

This article containing a direct attack against my person, which is in no way justified by the facts, I venture to put things right in the following return, and I am sure that you will kindly agree bringing my answer in one of the next numbers of your journal.

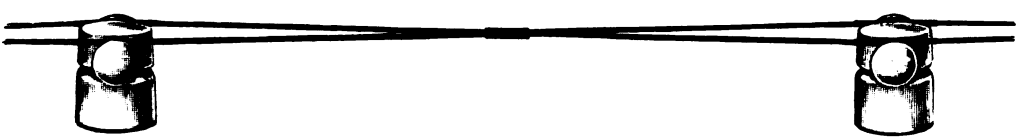
The "Inspector" says he is not a pious man, and, I am sorry to state, he is not a very scrupulous man, too. Otherwise he should have taken the trouble to study the specification of my letters patent No. 657,104, dated September 4, 1900. before writing his article in the November, 1900, issue, page 177, of THE TELEPHONE MAGAZINE. If he had done so. he ought to have noticed that application for the said patent was already made *on December 20, 1898*, the German patent being already applied for *in May, 1898*, that is to say, one year and a half *before his publication*, and he must confess that, indeed, German inventors are not so wicked and examiners in the American Patent Office not so stupid people as he suspects them to be.

He further ought to have found out some differences between my claim and his later idea, which I am immodest enough to put in favor of my construction.

I am aware that it has been proposed heretofore to cross the wires of adjacent circuits at regular intervals, and this idea I do not claim; but in such instances the crossed wires either have been supported *by two insulators* at each pole, or the crossing has been accomplished *in the neighborhood of the insulators*, where the wires can be rigidly secured out of contact with each other, whereas if they are crossed at points between the poles, sagging or swaying of the wires would cause them to get into contact with each other.

My invention comprehends the use of *insulated* wires, supported by one single insulator of a special form, the two

wires attached upon opposite sides thereof and *regularly crossing* in zigzag course *midway between every two insulators*, in order to do away with any inductional influences whatever of neighboring circuits. In fact, by binding the wires together at the points of crossing, the two wires of a circuit constitute a single mechanical structure with a single cross between each pair of insulators, which makes my method totally different from any other similar construction proposed as yet. You will surely come to the same conviction when kindly comparing the following sketch



of my method of stringing with that reproduced in the aforesaid article.

I think I do not need add any further word and remain, dear sirs, yours most respectfully, L. HACKETHAL.

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119. The Inspector speaks of drying out of cables, etc., when coated with shellac. For a number of years I have made a shellac varnish that has proven very satisfactory where used.

Take alcohol, one quart; gum shellac, six ounces. As all commercial alco-

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hol contains a small quantity of water, put it in a wide-necked bottle in which suspend strips of sheet gelatin. They will soften and swell, absorbing the water. When swelled, take out and put in other strips until the gelatin is not affected. You now have almost *absolute alcohol,* to which add the shellac. Keep corked, and when dissolved is ready for use. Hang up the strips of gelatin. They will dry out and can be used again. The amount of shellac can be increased, but I prefer a thin varnish, as it gives a neater appearance to the work, and, when applied, dries quickly.

W. R. H., Fairfield, Iowa.

HOW TO MAKE A DRY BATTERY.

First make a zinc cup, then roll a cup or tube of blotting paper, about three or four turns, to fit tight inside of the zinc cup, and pour in the bottom of the cup about two tablespoonsful of hot melted pitch or resin, to insulate the bottom of the cup. Next make your solution. This is done by dissolving five ounces of sal-ammoniac in one pint of clear water. When so dissolved, add seven ounces of granulated chloride of zinc. Stir thoroly till dissolved, and continue stirring every few minutes for one hour or more. The solution is then ready for use.

The manner of making a negative or carbon element is to mix eight ounces of powdered black oxide of manganese and sixteen ounces of powdered carbon thoroly together, and dampen or moisten with five fluid ounces of the solution. If the carbon and manganese are very dry, you may need a little more solution. All that remains now to complete the cell is to soak the blotting paper inside of the zinc can thoroly with the solution; fill the can about three-quarters full and let it stand a couple of minutes; then pour out the solution, place your carbon plate in the center of the zinc can and pack in your carbon element good and hard. The packing will probably force a little of the solution up the paper by compression, but that will not injure the cell any. When the powdered elements are wet enough, clean away all particles of the carbon element from the top of the paper and zinc can, so that there will be no internal short circuit; seal your cell, and when you have your connectors on, the cell is ready for use. This formula will produce a cell from 20 per cent to 50 per cent better than most of the dry cells of the present day.

ELECTRICAL GOODS IN HARDWARE STOCK.

At a meeting of the retail hardware dealers of Iowa, one of the papers read contained the following remark: In some parts of the State rural telephones are quite the fashion, and soon most farmers will have telephones and free delivery mail boxes. The hardware dealer should post up on these subjects and not only be able to furnish all the supplies in the way of wire, batteries, telephones, insulators, brackets, etc., but he should interest his farmer customers and promote new lines. The profits are small, but it requires no extra capital, as the sales are for cash, and it brings people into the store.

Electrical door bells and batteries are staple goods and are regularly called for, but there is a strong list of other electrical appliances that might be profitably handled, such as burglar alarms, automatic fire alarms, annunciators, motors, fans, house and factory telephones, call bells, electric-light wiring, etc. It is an interesting subject, and the ingenious dealer who fits up an attractive sample board, connected with a battery, will find profitable returns from this side line.

The much-abused lightning-rod should not be overlooked by the dealer who is ambitious to handle goods that will afford him more profit than the sale of saws at about cost. Most people believe that a well-made lightning-rod, properly put up, will afford some protection to the building thus equipped. The sale of lightning-rods will depend entirely on the ability of the salesman to work up sales. Few, if any, will come into a store and call for them, even though they have always considered them a good thing. It requires less ability to put up lightning-rods than to put up eaves-troughs.

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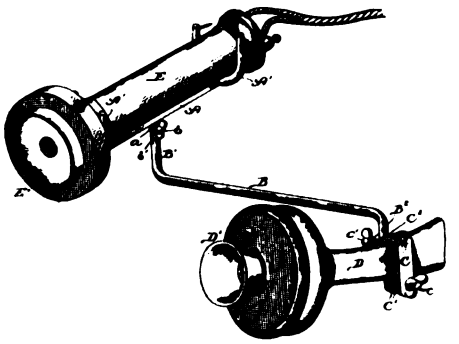
MONTHLY DIGEST OF TELEPHONE AND KINDRED PATENTS

EDITED BY CLARENCE C. BROWN.

Copies may be had, postage paid, by enclosing 5 cents for each one. Address inquiries in care of this magazine or Washington, D. C.

JOHN J. HARTL. No. 669,114, March 5, 1901.

And still they come. This is another method for holding the receiver to the



No. 669,114.

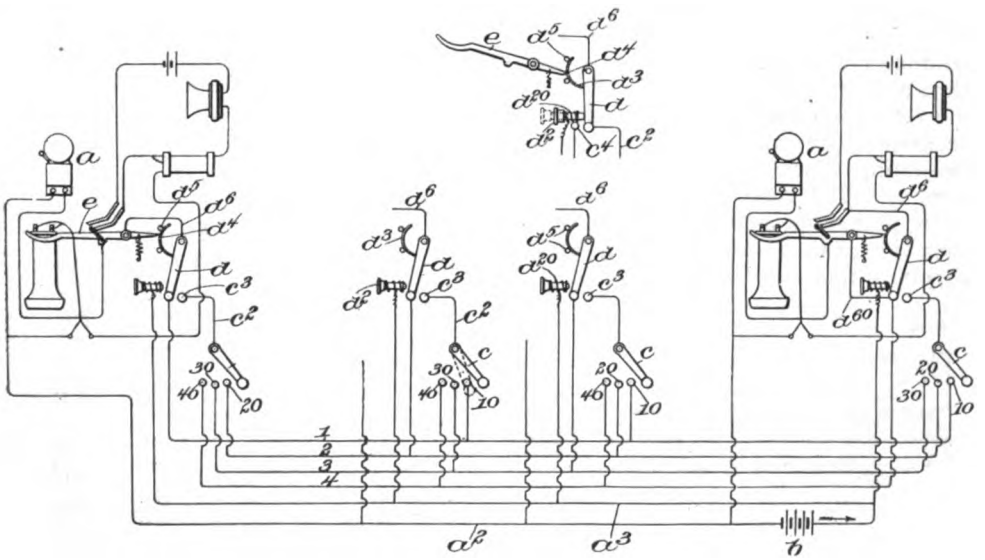
ear by a support. It is also arranged so that when placed in position it will remain until it is moved back to normal. The drawing explains itself.

N. H. HOLLAND. No. 670,022, March 19, 1901.

This intercommunicating telephone system is so arranged that the selective device is replaced at the home station when the receiver is placed upon the hook. The diagram is a system embodying the invention.

T. W. LORING. No. 670,408, March 19, 1901.

This signaling system is done by the aid of the induction coil throwing its current out on to the line. Of course there is nothing new in this, but the invention lies in the novelty of the interruption of the current and the switch springs. A description of the device in relation to the diagram is as follows: The telephone call-box is equipped with usual local battery, which, in connection with the induction coil, serves to transmit signaling currents of high potential over the external circuit or polarized annunciators or drops at the central office. Associated with the induction coil and battery are a number of switch contacts *a*, *c*, *m* and *r*, adapted respectively to be operated with the corresponding push-button extended thru the lid of the box. A polarized bell is also placed upon the lid of the box so that it may be signaled in the usual manner. By pressing one of these buttons it causes a current of one polarity to pass out upon the line and signal the drop of a like polarity. This allows for the 'phone to signal four distinct sections of the board respectively.



No. 670,022.

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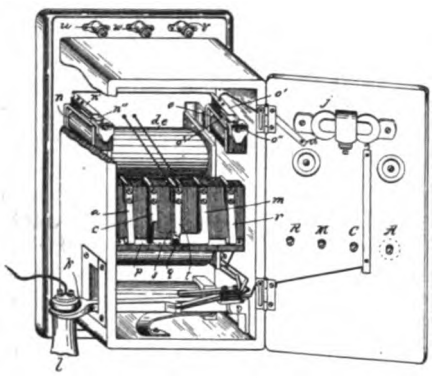
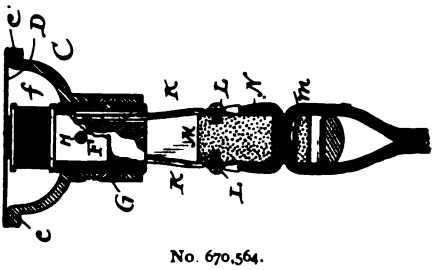
C. H. NORTH. No. 670,564, March 26, 1901.

The object of this invention is to make a lock upon the cord and make contact within the shell of the receiver, thereby doing away with the binding-post; also to make a receiver that can be readily adjusted, so as to be able to regulate the distance between the diaphragm and the poles. Referring to the drawing, the removal of the casing does not in the least interfere with the electric operation of the receiver, and the latter may thus be adjusted by sound, which is more accurate than by measurement. By making the external diameter of the shell *c* the same as that of the head of the casing *a*, the thread *b* on the shell is made continuous, which is claimed to be simple and cheap. The ends of the coil *f* are secured to insulated wires *k*, which pass down thru a longitudinal hole g^2 in the block *g*. At their lower ends these wires are secured by screws *l*, which take into an insulating block *m*, held between the bars *e*. The cord is prevented from being pulled out as it is transposed from each side of the block, thereby locking it permanently.



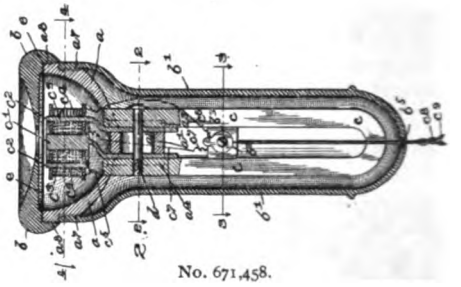
No. 670,408.



No. 670,564.

E. H. STRAUSS AND F. J. STEIN. No. 671,458. April 9, 1901.

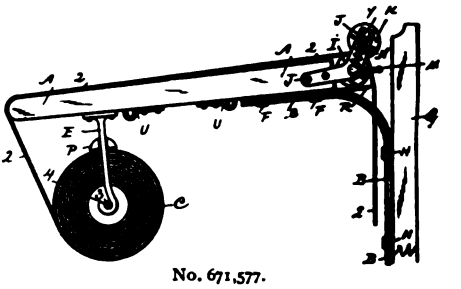
In this receiver the binding-posts are also done away with, and there is another method of adjustment that is illustrated fully in diagram.



No. 671,458.

C. E. BARTHOLOMEW. No. 671,577. April 9, 1901.

This device is intended to be placed within the battery box and to also provide a telephone with writing paper. The paper is on a roll and is held firmly in position by an extended metal strip placed on the outside of the battery box.



No. 671,577.

H. HERBSTRITT. April 16, 1901.

This invention, while combining the switching apparatus to the base of the desk stand, also provides for restoring the line to its normal condition after use. The diagram is a front elevation shown partially in section. The shell of the pillar is broken away in part to expose the switching mechanism and the connections inside. The contacts are arranged on a vertical strip of fiber. The connecting lever 14 is notched and plays against a cam 18, which is held in position by point 19. The numbers upon the outside and the switching rod are lowered to any of the contacts, thereby making the connection, and are

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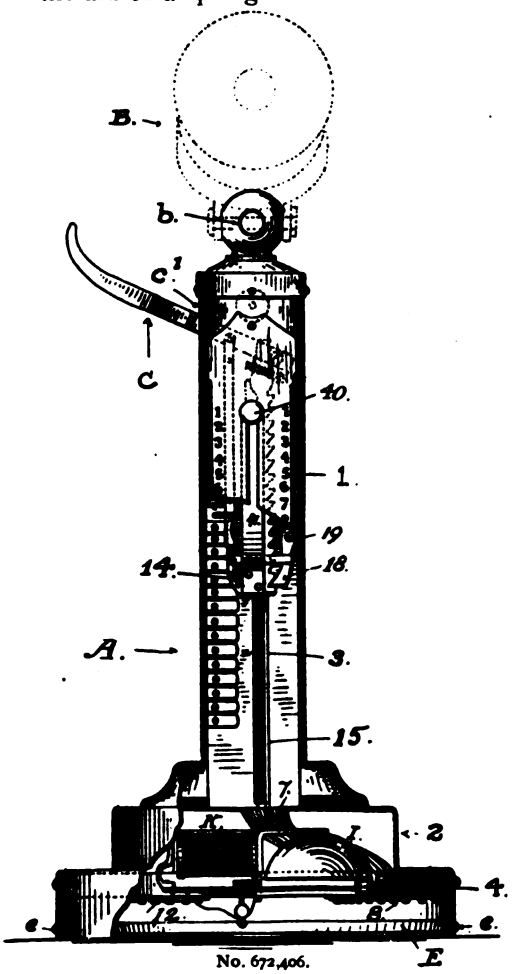
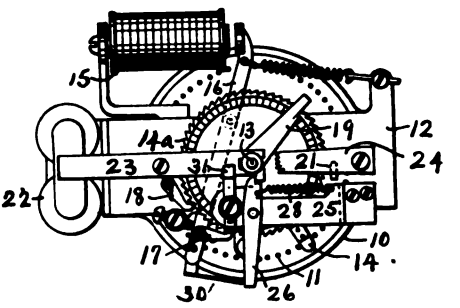
held in place by cam 18. The hook *c*, when depressed, acts upon the pivot 19, thereby throwing the cam and allowing the rod to pass into normal position by the aid of a spring.



No. 672,406.

F. A. LUNDQUIST. No. 672,327, April 16, 1901.

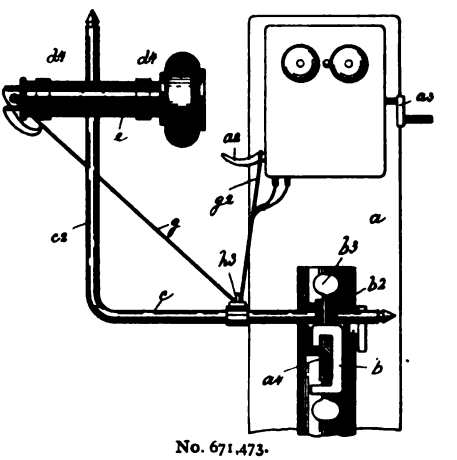
The form of switch illustrated in the accompanying drawing, makes a suitable connection for automatic telephone systems. It is the object of the invention to provide means for preventing the premature reëngagement of the pointer with its propelling mechanism so that the pointer may be definitely returned to its normal position, irrespective of the length of time which the current flows thru the releasing magnet. Referring to the drawing the object of this invention is thoroly seen.



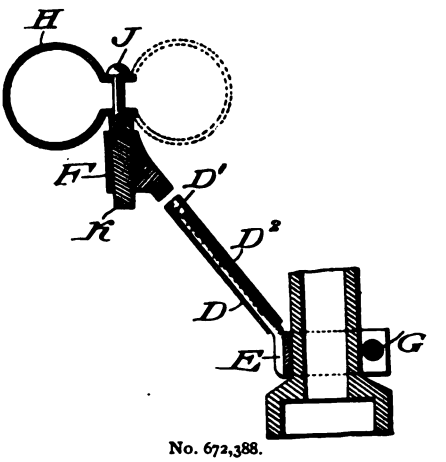
No. 672,327.

T. EMERSON. No. 671,473, April 9, 1901.

This is another device to hold the telephone receiver. This is provided in such a manner that by turning the receiver toward the ear it causes the hook to be pulled down, by the aid of a string and an eyelet. The drawing illustrates it fully.



No. 671,473.



No. 672,388.

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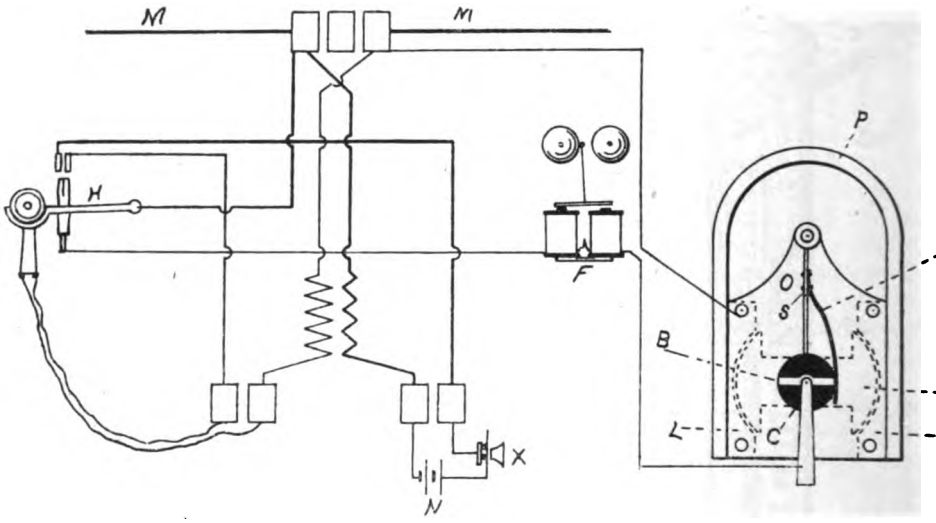
C. H. NEWALL. No. 672,388, April 16, 1901.

This is a different method for doing the same thing, only it uses a differential level to depress the hook.

WARD DECKER. No. 671,311, April 2, 1901.

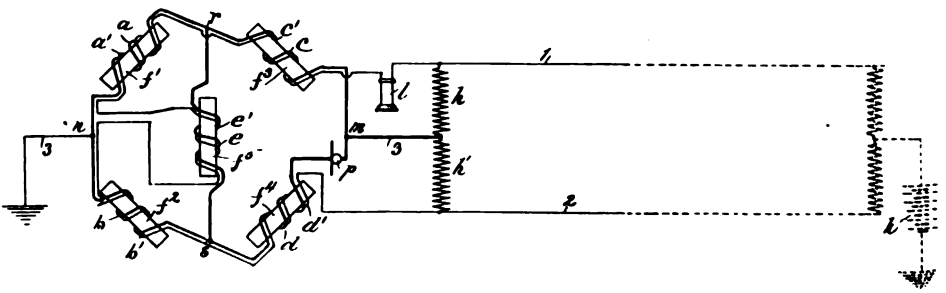
This is a telephone shunt for use in magneto signaling. When actuating the generator to produce a current, it is so arranged that the armature is short-circuited twice in each revolution, but as this takes place when the armature is at the dead point, the short-circuiting does not affect the action of the generator. In the diagram, the spring *s* lays against the brass strip *c*, which is in contact with the other side of the armature, so that when the generator is not in use the current is shunted across the frame. This does not affect the generator in any other manner than stated above.



No. 671,311.

W. W. DEAN. No. 670,538, March 26, 1901.

This invention relates to a subscribers' telephone circuit, the object being to provide a method for improved construction whereby a telephone transmitter is effectively supplied with current, and serves to vary the resistance so as to produce the talking currents. In the invention the battery circuit is provided with a Wheatstone bridge, in one of the arms of which the microphone or transmitter is inserted; while in the plurality of the arms of the bridge, the primaries of the induction coil are placed. This causes the action of the microphone to vary the currents flowing thru the primary coils. In inductive relation with the primary coils, secondary coils are provided, which are connected together with the talking circuit extending to the central sta-



No. 670,538.

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tion. The several secondary windings are connected together, so that the induced current will be increased, thereby producing an effective talking current. The necessary resistances in the several arms of the bridge are thus utilized for the induction coils to transform the variation of the primary currents into the induced secondary windings. In practice it is preferable to mount the several primary coils and the secondary coils upon a common core, whereby the elements may all be united so that they may be readily connected with the subscriber's station.

PATENT INSURANCE.

The Patent Title Guarantee Company, of New York, exploits an entirely new plan of insurance, designed to afford protection to inventors and owners of patents who have limited means. For two per cent per annum of the amount of insurance contracted for they will agree that, " in the event of an infringement of said patent granted by the United States Government, this company will institute and contest a suit of infringement in the proper United States court free of cost to the patentee, and will pay such patentee, if said suit is successful, the total amount of damages recovered, *but does not guarantee* the payment of such damages for a greater sum than the amount of this contract. This company does agree, however, in the event that the amount of damages collected exceeds the amount of this contract, to pay the patentee the total amount of such excess damages less ten per cent. If judgment is obtained in favor of said patentee, the court costs, known as the 'Bill of Costs,' if awarded in favor of the patentee, shall be paid to this company."

In other words, if the patentee contracts for $5,000 insurance, he pays a yearly premium of $100. If suits for infringement are successful he gets the amounts collected. If these amounts exceed $5,000, he gets it all less ten per cent commission on the excess.

Allan C. Durborow, Tacoma building, Chicago, Illinois, will be glad to mail complete information to those who write for it.

THE OUTPUT OF HARD RUBBER RECEIVER SHELLS.

There is a steady demand for hard rubber telephone fittings. One estimate places the output of telephone receivers at about 23,000 per week, which average would give a total of 1,200,000 in a year. By the way, receivers are being sold now at only 10 per cent of the price first charged for the same articles. Reduction in the cost of manufacture has had much to do with the decline in price. By the way, the secret of profitable manufacture in every branch is cheapening the cost of production — without debasing the goods — and not the study of how far selling prices can be cut down.

DOES THE ELECTRIC CURRENT KILL?

N. Schellinger, an electrician of Chicago, in the presence of a number of persons interested in the progress of science, shocked a cat apparently to death, and when the heart of the feline had long ceased to beat, Mr. Schellinger reversed the current of electricity and the shock restored the heart beats, altho they were very feeble at first. Within two hours after the cat had been pronounced dead it had been restored to the fulness of life and vigor, and was as playful as ever. Electrician Schellinger says there is no doubt in his mind that any person who has been seemingly killed by an electric shock can be restored, if intelligent action be followed on the lines adopted by him in this case, and if the victim can receive such attention within a few minutes after the accident.

SUBSTITUTE FOR RUBBER.

Consul Nelson, of Borgen, reports the discovery, by a Copenhagen chemist, of a cheap substitute for rubber. It is a material called "Solicum," which the consul says possesses qualities that will render it of the greatest importance to the caoutchouc industry. It is produced, it seems, from asphalt, and can be used for the manufacture of insulators. It is also claimed that the material can be used as a paint, in all colors, and that it is absolutely waterproof.

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TRADE NEWS.

The Kellogg Switchboard & Supply Company, Chicago, reports a steady increase of business in all departments. A few months ago ten thousand square feet of additional floor space were added to its already large and well-equipped factory, and arrangements have been recently made for the addition of 21,000 more. This will be equipped with the most modern machinery, and will facilitate the handling of orders with even greater promptness than heretofore.

The small switchboards of the "Express" type which this company recently put on the market have proven very popular and are in great demand, orders for over fifty having been received since March 15. In order to meet the demand for silk and cotton-covered wire and switchboard cable, the insulating department has been increased to double its former capacity, and is prepared to fill orders for any size or kind of silk or cotton-covered wire on short notice.

The company also announces that it owns 90,000 of the finest cedar poles in Michigan, which it is prepared to supply in carload lots at lowest prices.

Among the orders for small switchboards varying in size from 50 to 300 lines each recently received are the following: Williamsburg, Pa.; Russell, Iowa; Somerset, Pa.; Chrismaw, Ill.; Webster, S. D.; Granbury, Tex.; West Chester, Pa.; Bartelsville, I. T.; Bishop Hill, Ill.; Woonsocket, S. D.; Tama, Iowa; Royersford, Pa.; Columbus Junction, Iowa; Little Rock, Ark.; Marco, Ind.; Shawnee, Ohio; Canadian, Tex.; Troy, Ind.; Savannah, Ill.; Chadwick, Ill.; Black River Falls, Wis.; Astoria, Ill.; Concordia, Kan.; Ashland, Ky.; Blue Rapids, Kan.; Greenleaf, Kan.; Huntingburg, Ind.; Virginia, Ill.; Logan, Kan.; Hurley, S. D.; Sparta, Ill.; Miltonville, Kan.; Scandia, Kan.; Streitsville, Ohio; Lexington, Miss.; Story City, Iowa; Versailles, Mo.; Dalton, Ohio; Doylestown, Pa.; West Grove, Pa.; Westphalia, Ind.; Linton, Ind.; Clifton, Kan.; Sanborn, Ind.; Estelline, S. D.; San Francisco, Cal.; Joy, Ill.; Blue Earth, Minn.; Augusta, Ill.; Sullivan, Ind.; Dawson, Minn; Wellsboro, Pa.

THE Electric Appliance Company, Chicago, reports large sales of its new type No. 11 long-distance telephone, upon which it makes a price of $8.50.

THE American Electric Fuse Company will be more than pleased to send out a description of its new and up-to-date lightning arresters, which truly arrest.

THE American Electric Telephone Company announces that it is having an enormous sale for its express board. This company makes a very handsome line of apparatus, and would be pleased to send its descriptive matter to any one interested in telephony.

THE D. M. Steward Manufacturing Company, Chattanooga, Tennessee, is creating quite a demand for its lava insulators and small bushings to be used on switchboards and telephones. The company will send samples and more information on this subject upon receipt of any inquiry.

THE Western Telephone Construction Company, Chicago, Illinois, and Winthrop, Illinois, is now settled in its new factory and offices. Owing to the amount of business this company had on hand it was compelled to keep its old factory running in conjunction with the new one to catch up with its orders. The Western Company always has some new literature pertaining to telephony which it will be pleased to mail to your address.

THE Eureka Electric Company is now running full force in its new plant, and it claims its factory to be one of the finest telephone factories in operation. The company announces that it will be pleased to have you visit its plant while in Chicago.

THE Garton-Daniels Company, Keokuk, Iowa, reports that it is placing a great many of its telephone extension circuit ringers in the different telephone exchanges thruout the country. This is one of the many new devices that have come upon the market which help to mark the advancement of the art.

THE Connecticut Telephone Electric Company reports a very large sale of its new generators and telephones.

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THE ALTON RAILROAD PREFERS THE TELEPHONE.

The Chicago & Alton Railway Company uses the telephone for the transmission of all business between Chicago and Bloomington headquarters, except train orders. The system is going to be rapidly extended until all official business shall be carried on over the phones. The long-distance system which extends from Chicago to Bloomington is working like a charm, and in its four months of operation has grown invaluable. There are now on an average of one hundred conversations per day over this line. In the Bloomington offices there are six branches and in Chicago there are twenty-five. The line when first constructed had branch offices leading to the Monadnock building, union depot and a few other places. As the service proved valuable, it was extended, an instrument being placed as far south as Chappell, and also at other places, until now there is one in every office of the company in Chicago. The extensive utilization has supplanted the telegraph almost entirely. The one operator left in Chicago finds his occupation gone, and is used to handle the block signals. He has but little telegraphing to do. In addition to being reliable, the service is absolutely secretive, is quick and saves an incalculable amount of time and work. The officials wonder how they got along without it in the past. Superintendent of Telegraph H. V. Miller, who had charge of the construction of the line, upset some old-time notions about the telephone system. He was informed by those supposed to be posted that the line would be a failure because he ran his wires alongside those of the telegraph. There are something like twenty-eight telegraph wires on the same poles with those of the telephone. Mr. Miller went ahead regardless and found that the system was not affected a particle by the juxtaposition of the other wires. He also ran his telephone wires in cables under the Chicago river and was informed that this procedure would also prevent perfect operation. He knocked this theory galley west and demonstrated that that idea was equally wrong. It works perfectly regardless of weather conditions and is so constructed that the wires can be instantly converted into those for telegraphic purposes in case of trouble to the latter.

THE TWENTY-FIFTH BELL ANNIVERSARY.

The annual stockholders' meeting of the American Telephone & Telegraph Company, held in New York March 26, marked the twenty-fifth anniversary of the invention of the telephone by Professor Bell. In a retrospect of the progress since that time, the report of Acting President Cochrane said: "Twenty years ago there were 47,880 telephone subscribers in the United States, and 29,714 miles of wire in use for telephonic purposes. At the end of last year there were 800,880 exchange stations equipped with our instruments, and 1,961,801 miles of wire were employed for exchange and toll-line service." The following table was presented, showing the increase in exchange equipment:

	Jan. 1, 1892.	Jan. 1, 1900.	Jan. 1. 1901
Exchanges	788	1,239	1,348
Branch Offices	509	1,178	1,427
Miles of wire on poles	180,139	509,036	627,897
Miles of wire on buildings	14,954	15,087	16,833
Miles of wire underground	70,334	489,250	705,269
Miles of wire submarine	1,029	3,404	4,203
Total miles of wire	266,456	1,010,777	1,354,202
Total circuits	186,462	422,620	508,262
Total employes	8,376	25 741	32 837
Total stations	216,017	632,946	800,880

On extra-territorial and toll lines there were 101,087 miles of pole-lines and 607,599 miles of wire, being an increase over last year of 11,795 miles of pole-line and 105,767 miles of wire. There were on the average 148,528 toll connections daily, and the revenue from this source alone in the year 1900 was $8,972,030.90, not including the earnings of the American Telephone & Telegraph Company itself. The estimated number of daily exchange connections is 5,668,986, or about 1,825,000,000 per year. The average number of daily calls from each station is 7.1, the cost to the subscriber varying in different places from 1 cent to 9 cents per connection. The investment in line construction, equipment and supplies for the long-distance system up to December 31, 1900, was $16,152,020.72.

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UNUSUAL SITUATION AT PITTSBURG.

The present telephone situation in Pittsburg is unique. There are three live companies there and two sleeping ones. All five have franchises worth fighting for. Of the three live companies, the Bell is naturally the largest. In Allegheny county and the cities of Pittsburg, Allegheny and McKeesport, 40 boroughs and 50 towns and villages, it lists nearly 16,000 subscribers. There are as many more subscribers in the remainder of its territory in the State.

Next comes the Pittsburg & Allegheny Telephone Company, the new independent company promoted by Baltimore capitalists. It claims 2,000 telephones in Pittsburg and 500 in Allegheny. It has no service outside these cities, but expects to have toll-line connections with the exchanges in Braddock, Homestead, Wilkinsburg and Verona. The rumor is prevalent that this company will pass into the hands of the Federal Telephone Company, an organization that has been most vigorously fought from the day of its formation, but which has won all its battles. The Bell Company fought it bitterly and found itself outclassed. The Pittsburg & Allegheny Company filled the daily papers with stories about its being a Bell ally, and even went so far as to try to induce Judge Thomas to use the power of the National Association for its extermination. Now the Pittsburg & Allegheny employes are wondering how many days will see them on the Federal pay-roll.

The Federal Company paralleled the Bell's main trunk lines along the north bank of the Ohio, from Allegheny to Rochester, a distance of twenty-five miles. It did the same thing along the Monongahela river, from McKeesport to Brownsville, a distance of forty-four miles. In the eighteen months that have elapsed since its organization, the Federal Company has secured franchises and completed its lines in forty-two boroughs and connected nearly all by toll lines. It has purchased a score of companies and has applied for franchises in forty-seven boroughs. Should it succeed in purchasing the Pittsburg & Allegheny Telephone Company, it could have one hundred cities, towns and villages connected to the Pittsburg exchange within thirty days from the date it assumed control.

Without these out-of-town connections there can be no true competition in Pittsburg. The Federal Company can give these out-of-town connections, but can give no Pittsburg service. The Pittsburg & Allegheny can give a city service, but no out-of-town connections. The ordinary procedure would be a consolidation of interests or a working agreement, but the Pittsburg & Allegheny refuses to enter into either one. As the Federal has invested more than a half million of dollars, it must have a Pittsburg connection in order to preserve its investment, even if it purchase one at a high price. It can build under its own franchise, but to do so would necessitate a Pittsburg investment of more than $500 per telephone, or over $7,000,000 for approximately fifteen thousand subscribers. The Federal Company will likely take over the Pittsburg & Allegheny Company and give the Bell Company its whippings.

FORFEITURE OF CUMBERLAND TELEPHONE COMPANY'S CHARTER URGED.

State Attorney-General Breckinridge has filed suit in the Franklin Circuit Court at Frankfort, Kentucky, against the Cumberland Telephone Company, asking that the charter of the defendant corporation be revoked and forfeited. The company is charged with having violated section 201 of the Constitution which prohibits common carriers from consolidating with or purchasing or leasing parallel and competing lines.

The style of the case is the Commonwealth against the Cumberland Telegraph and Telephone Company, and the specific acts of the defendant upon which the prosecution is based are the recent purchase of the old Kentucky Telephone Company, the Lancaster Telephone Company, the Richmond Telephone Company, Paris Telephone Company, and Cynthiana Telephone Company, which are described as com-

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peting lines. A map showing the same is filed as an exhibit.

After reciting the section of the constitution on which the prosecution is based and section 205, which prescribes the penalty of forfeiture of charter, followed by a recital of the lines absorbed, the petition closes with the following prayer:

"Whereupon plaintiff prays that the charter of the defendant company be revoked and all of the rights, powers, privileges and franchises granted to and exercised by said company be likewise revoked and held for naught, and that said company, in such manner as the court may direct, at once to make settlement of its affairs and cease operation in this commonwealth, and it prays for all equitable and proper relief."

TAPING A CABLE JOINT.

To secure a tubular, waterproof, high-insulation joint with tape it is necessary to have the surface clean and free from the fiber of the braiding. The tape is then wound over with a half lap until it covers one inch at least at each side of the joint. A little heat is then applied from a match or clear flame, and the joint slightly kneaded while still warm. A second layer is then put on wound in the opposite sense and similarly treated. Additional layers will secure higher insulation in accordance with the grade of cable used. It is easy to demonstrate the tubular, and, therefore, waterproof nature of such a joint by splitting it longitudinally, when, if properly made, a tape will be found consisting of diagonal short pieces of the original tape firmly jointed one to another.

HOW A FARMERS 'PHONE SAVED A CHILD'S LIFE.

The life of the five-year-old daughter of James Zeis, residing at Cromer Station, five miles west of Tiffin, Ohio, was saved by telephone last night. The child was given a large dose of ammonia by mistake. A Tiffin physician was called by telephone, and he directed that the proper antidote be administered, pending his arrival, and thus saved her life.

TO BREAK BELL MONOPOLY.

The attempt to break the telephone monopoly which the Bell interests hold in Connecticut thru the agency of the Southern New England Telephone Company is to be renewed before the pending General Assembly. The Waterbury Automatic Telephone Company has filed a formal petition for an act of incorporation, authorizing it to conduct a telephone business in Waterbury and adjacent towns. It seeks to surmount the general law by going direct to the General Assembly and asking for a special charter and desirable privileges. All the Independent interests will rally to the support of the Waterbury proposition, and it is probable that they will make an effort to have the teeth taken out of the general law which confirms the monopoly rights of the Bell system.

The completeness of the Bell monopoly may be inferred from the fact that the only Independent corporations which now remain are the Ansonia Telephone Company, which has subscribers in Ansonia, Derby and Shelton; the Winsted Telephone Company, which operates in the town of Winchester, and an exchange which has lines in Canaan, Sharon and Woodbury.

TERRE HAUTE STATEMENT.

The Citizens' Telephone Company furnishes a statement to the effect that the plant will be completed and that the service will be ready within thirty days. Representatives of the Citizens' Company say that there is no truth in the report that an offer has been made to sell out, but that, on the contrary, offers have been rejected, one of them of $75,000, by a Terre Haute banker. It is also said that a would-be purchaser from out of town has since been learned to be a representative of the Bell Company. The Citizens' people say they have 900 subscribers. All the stock is held in Terre Haute. Henry A. Coit, who came here from St. Louis to promote the new company, will retire and Harley Pritchett will be the manager. The company recently issued $100,000 worth of bonds, which will be floated as soon as the exchange is in operation.

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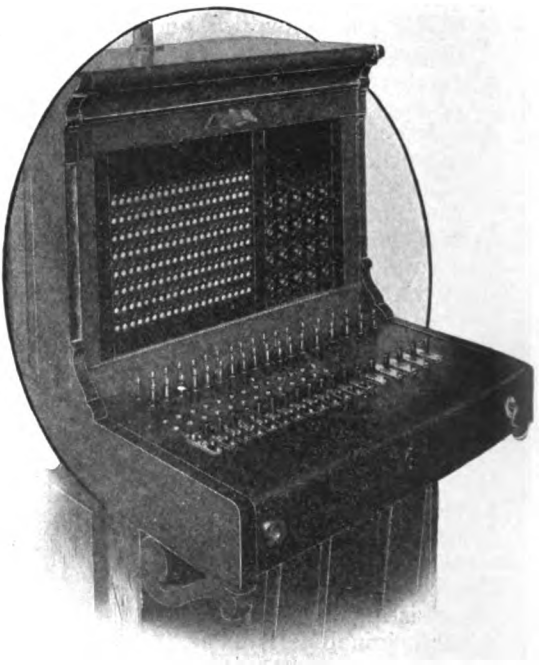
KELLOGG EXPRESS SWITCHBOARDS.

The Kellogg Express Switchboard, recently put on the market by the Kellogg Switchboard & Supply Company, Chicago, has been designed to meet the need of small exchanges for a board of capacity ranging from 50 to 200 lines, which gives a service comparing favorably with that of multiple boards in large cities. Kellogg small switchboards are built from a variety of designs and are adapted for such uses as an office building or exchanges in small towns. They can be operated by the magneto system or by central energy. When used with the magneto system, they are equipped with combination mechanically self-restoring drops and jacks. These are the most perfectly designed drops on the market. They are very simple in construction and seldom get out of order. But two contact springs are needed, one of which projects thro the mounting strip and engages the shutter upon the insertion of the plug into the jack, restoring the shutter to its normal position, at the same time cutting the drop out of the talking circuit. The drops and jacks are mounted five per strip on a hard rubber base backed by heavy brass, and an iron framework. This gives great rigidity and insures perfect alignment of the working parts. The drops are of the tubular type, having, therefore, the highest mechanical and electrical efficiency. All parts are easy of access and any drop and jack or any part of one may be easily removed for inspection or repairs. For long toll lines very sensitive ringers are frequently provided, having latch drop indicators. For use with central battery, a board has been put on the market which is equipped with all the latest features in the way of lamp line signals and the lamp double supervisory system. The lamp signals are mounted in banks of twenty in a solid hard rubber strip which insures perfect insulation and good mechanical construction. The answering jack corresponding to each lamp is placed immediately above the lamp. The lamp supervisory system is so arranged that but two contacts are needed for each jack. A lamp is connected with each plug of the cord circuit, and by means of it the operator is kept fully informed of the condition of each of the two connected subscribers' lines without the necessity at any time of listening in. During a conversation both lamps are out, but as soon as either party hangs up his receiver the corresponding lamp is lighted. When both lamps are lighted the operator knows that the conversation is ended and pulls out the plugs. In this way an operator is enabled to handle more than double the number of calls previously possible.

A combination board for both central energy and magneto lines is shown in the accompanying cut. This board has a capacity of 160 central energy



lines and twenty magneto lines. The central energy lines have lamp line signals and the lamp double supervisory system. The magneto lines have self-restoring drops and tubular clearing-out drops. The board is provided with eighteen pairs of plugs and cords complete with cam combination ringing and listening keys. The woodwork is of oak but may be of any other wood desired. The wiring is brought down to a connecting rack in the rear.

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TELEPHONE NEWS.

ALABAMA.

MONTGOMERY, ALA.—The American District Telephone Company was incorporated. Capital stock, $25,000. Incorporators: George H. Fearons, New York; E. Winter, Montgomery; E. E. Williams, Birmingham, and J. H. Stephens, Atlanta. The purpose is to conduct general telegraph and telephone service for individuals, messenger service, police and watchmen's call, and fire alarms in warehouses. Business will be thruout the State, Montgomery being the principal place.

CALIFORNIA.

SONORA, CAL.—Mountain Automatic Telephone Company. Principal place of business, Sonora, Tuolumne county. Directors, W. O. Doxie, P. M. Keefe, M. S. Sanford, W. S. Griffith and J. P. O'Brien. Capital stock, $50,000.

COLORADO.

IDAHO SPRINGS, COLO.—The Pasquez Valley Telephone Company, an independent company, made application for franchise for the erection of poles and putting in an exchange at this point.

CAROLINAS.

WILSON, N. C.—The Wilson & Tarboro Telephone Company will increase its capital stock from $10,000 to $25,000.

JACKSON, S. C.—The Harmony Grove Telephone Company has just completed a local telephone system for this place, under the direction and supervision of Judge H. W. Bell, vice-president of this company.

DAKOTAS.

JAMESTOWN, N. D.—Receiver James Murphy, of the North Dakota Telephone & Electrical Company, has decided to sell the telephone line at a private sale. The line is located in Foster and Wells counties and connects Harvey, Fessenden, Carrington and other towns. Since the line has been in the hands of a receiver it has paid handsomely.

CANTON, S. D.—The Canton Coöperative Telephone Company met and elected the old board of directors: Charles E. Judd, president; M. L. Syverud, vice-president; F. H. Bacon, secretary; C. M. Seely, treasurer; C. B. Kennedy, and H. N. Cooper. The company declared an annual dividend of twelve per cent and may extend the line to Moe, a town twelve miles south.

CLEAR LAKE, S. D.—Articles of incorporation were filed for the Citizens' Electric Light & Telephone Company, at Clear Lake, with a capital stock of $10,000. Incorporators, Alfred G. Warner, Josephus C. Plank, Elias P. St. John, Tracy E. Sanborn, George Artus.

FAIRVIEW, S. D.—The farmers of Fairview township, Hanson county, have formed a telephone association and will build a line to Alexandria, where they will connect with the local exchange.

PIERRE, S. D.—Articles of incorporation have been filed at the state capital for the Universal Wireless Telegraph Company, with a capital stock of $20,000,000. The incorporators are James N. Huston, Thomas B. Bishop and L. C. Smith.

WEBSTER, S. D.—The Webster Telephone Company has been incorporated, with $10,000 capital stock. Materials are arriving for the new plant.

FLORIDA.

ARCADIA, FLA.—The Arcadia Electric Light, Telephone & Ice Company has decided to incorporate with a capital stock of $20,000. The officers are: President, J. J. Heard; vice-president, C. C. Chollar; secretary and treasurer, J. L. Jones. The board of directors comprise the above officers and include J. H. Treadwell and W. A. Hendry.

DE LAND, FLA.—Watts & Miller have applied for a telephone franchise.

INVERNESS, FLA.—Letters patent have been granted incorporating the Florida Telegraph & Telephone Association, with headquarters at Inverness. The capital stock is $5,000, which may be increased to $250,000. The association will construct, maintain and operate telegraph and telephone lines, offices, exchanges and instruments, connecting with other telegraph and telephone lines, and deal in real and personal property. Among the incorporators are William K. Jackson, president; James P. Wilson, vice-president, and J. M. Young, secretary and treasurer.

TAMPA, FLA.—The notice of the application for the charter of the new telephone company has been published. It will be known as the Peninsular Telephone Company, with a principal place of business in the city of Tampa. The capital stock is placed at $300,000, at $100 a share. William G. Brorine, Jacob F. Brorine, Guy Hufman, James W. Barwick and James J. Lunsford are the incorporators, and compose the board of directors. This corporation will have the franchise for a telephone system which was granted last week to Brorine & Hufman by the council of this city. The company has placed the price of business telephones at $2.75 a month, and residence 'phones at $1.50, and several hundred subscribers have already been secured. The same company will erect systems in Lakeland, Bartow, Fort Meade, Plain City, Fort Myers, Arcadia and Palmetto at once, and they will all be connected.

GEORGIA.

ATLANTA, GA.—The Standard Telephone Company is reported to make extensive enlargements and improvements to its Atlanta system. Address Albert Baltz, president, Philadelphia, Pennsylvania.

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MACON, GA.—J. W. Beeland, from Reynolds, was here to secure privileges for establishing a telephone station to connect with Reynolds, Butler, Marshallville, Montezuma and other south Georgia towns.

SAINT PETERSBURG, GA.—The Saint Petersburg Telephone Company has recently been incorporated by T. C. Parker and others, for $10,000.

WINDER, GA.—The North Georgia Telephone & Telegraph Company has been organized for construction of a system from Winder to Athens and from Winder to Augusta. R. B. Russell, president.

ILLINOIS.

ANNA, ILL.—Incorporated: Advance Telephone Company, Anna. Capital stock, $17,500; operating a telephone system; incorporators, F. W. Willard, Ed Samson, George A. Bell.

ARCADIA, ILL.—The Liter-Arcadia Telephone Company has elected the following officers: President, L. A. Barr; vice-president, C. P. Henderson; secretary, John Hitchens; superintendent of lines, F. B. Henderson; treasurer, S. T. Erixon; board of directors, A. J. Ogram, C. P. Henderson and D. K. McCarty.

ARGENTA, ILL.—O. E. Duddlesten has secured a franchise for a telephone system in Argenta, Macon county, and will put in a local exchange.

BARRY, ILL.—The city council granted the Pike County Telephone Company the right to enter the city, and also granted Weber & Ware the right to maintain a local exchange. The clerk read the acceptance of the ordinance by the El Dara and Hadley Telephone Company and it was placed on file.

BARDOLPH, ILL.—The Bardolph and Good Hope Telephone Company is one of the latest organized.

BAYLIS, ILL.—Angus N. Orr and Clarence Tucker, two young telephone promoters, were in Baylis looking over a telephone connection with their farmers' line in Brown and Adams counties.

BLANDINSVILLE, ILL.—The Blandinsville town board has granted W. H. and C. A. Fisher, of that place, a telephone exchange franchise to run for thirty years.

CAIRO, ILL.—The stockholders of the Cairo Telephone Company have elected the following officers: President, Andrew Lohr; vice-president, Marion C. Wright; secretary and treasurer, John S. Aisthorpe; general manager, Thomas W. Gannon. Proposals were received for a new exchange equipment which will be put in within the next two months.

CAMBRIDGE, ILL.—The Citizens' Mutual Telephone Company. Capital stock, $2,500. Incorporators, William M. Smith, Clyde B. Taylor and John W. Nelson.

CARLINVILLE, ILL.—J. A. Fletcher will build a line to include the towns of Divernon, Pawnee, Loami and Antonia.

CHICAGO, ILL.—Independent Telephone Construction Company. Capital stock, $2,500; manufacturing telephone supplies; incorporators, James P. Harrold, Worth E. Caylor, William Mannhardt.

CENTRALIA, ILL.—William Finn, of Salem, was granted a telephone franchise. Nelson S. Mercer, of Omaha, Nebraska, is backing the enterprise.

CHICAGO, ILL.—The Advance Electric & Telephone Company. Capital stock, $15,000. Incorporators, V. Horace Messenger, H. Henry Hansen and George A. Thompson.

COLETA, ILL.—The Genesee farmers east of Coleta have organized a telephone company. The following are the officers elected: President, Mathias Wolber; vice-president, Peter Eckler; secretary, James Horlacher; treasurer, Charles Munz; lineman and superintendent, John Eckler.

DIXON, ILL.—The directors of the Lee County Telephone Company were all reelected for another year. They are: L. D. Pitcher, I. B. Countryman, W. C. Dysart and J. C. Ayres, L. D. Pitcher was reëlected president and W. C. Dysart treasurer. Louis A. Pitcher, secretary.

GALESBURG, ILL.—At the meeting of the county board of supervisors petitions for telephone line franchises were granted to H. M. Robbins and E. R. Shaw, for a line to Wataga; to the Gilson Farmers' Telephone Company, the Altona and Nekoma Telephone Company, and to the Bridgeport and London Mills Farmers' Telephone Company.

GALESBURG, ILL.—F. L. Bills has secured a franchise for a telephone system at Galesburg and says that the exchange will be built there even tho not another dollar's worth of stock is taken there. He says the contract for half the material is already let. The company has seven hundred subscribers guaranteed and one hundred and fifty citizens have taken stock in the enterprise.

HARRISBURG, ILL.—At the recent annual meeting of the Saline County Telephone Company, held in Harrisburg, Illinois, a fifteen per cent dividend was declared and officers were elected for the ensuing year. The officers are: Dr. M. D. Mitchell, president; G. H. Mitchell, vice-president; C. F. Parker, secretary and general manager, and T. E. Webber, treasurer. The company owns sixty miles of toll lines in the county and has exchanges in Harrisburg, Eldorado and Galatia.

KEWANEE, ILL.—The Stark County Telephone Company, of which Dr. Parsons, of Elmira, and E. G. Cole, of Toulon, are proprietors, is putting up a new line which will give a number of farmers southeast of the city connection with the system. This company now has central stations at Elmira, Neponset, Buda, Osceola, and will soon have one at Bradford.

LA SALLE, ILL.—The Northern Illinois Telephone Company has been granted a franchise.

LAWRENCEVILLE, ILL.—Lawrence County Telephone Company; capital stock, $23,500; operate a telephone system; incorporators, S. J. Gee, A. N. Fink, A. M. Maxwell.

MACON, ILL.—The farmers living between

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this city and Boody have organized a telephone company. The following are the officers of the company: Henry Pistorious, president; Everet Zimmerman, secretary; Pete McGaffy, treasurer.

MALTA, ILL.—The DeKalb County Telephone Company is getting the right of way for a telephone line from Malta thru Clare and Esmond to Fairdale.

MORRISON, ILL.—The city council granted the Farmers' Telephone Company, from the south, a franchise.

MOUNT STERLING, ILL.—The Base Line Telephone Company is a new corporation of this county, doing business in Mount Sterling, Lee and Pea Ridge townships. The officers of the new company are: A. L. Worthington, president; E. D. Nelson, secretary; George Pitzer, treasurer; J. T. McPhail, Harry Means and Lee Brown, directors.

MOUNT VERNON, ILL.—At the meeting of the stockholders in the Tri-county Telephone Exchange Company, held in Tamaroa Friday afternoon, J. M. Dycus, of Blissville; J. D. Norris, of Bald Hill; William Willis, of Elk Prairie, and Charles H. Judd, of Moore's Prairie, were elected directors to represent Jefferson county on the board. It was voted to increase the capital stock of the company from $10,000, its present limit to $15,000.

PAXTON, ILL.—The Lyman Telephone Company has been organized for the purpose of running a telephone line between Roberts and Thawville. The board of directors is composed of Dr. F. S. Diller, president; O. J. Roberts, R. B. Chambers, John Sutton and G. W. Wadden. The secretary and treasurer is R. E. Bradbury. Work on the new line will begin as soon as the material can be obtained.

PEKIN, ILL.—The council will grant a franchise to the Celestial Mutual Telephone Company.

QUINCY, ILL.—Franchise has been granted to the Adams, Pike & Hannibal Telephone Company.

RICHARDSON, ILL.—The homes of farmers in this section will soon be connected by telephone. A company which purposes to run lines from here to Alpha and to Audelia has been organized, with a capital stock of $750. C. H. Blewett was elected president, S. Harben, secretary, and William Guion, treasurer. In addition to the two long-distance lines, farmhouses in the neighborhood will be connected by party lines.

ROBERTS, ILL.—A ten-year franchise has been granted to the Lyman Telephone Company at Roberts. The company is to pay $5 annually for putting poles and wires in the streets.

ROCKTON, ILL.—The Winnebago County Telephone Company are about to establish an exchange in this place. They have practically completed the organization of the company and have secured from the supervisors a franchise for the erection of their lines thruout the county.

SIDNEY, ILL.—Sidney Home Telephone Company. Capital stock, $2,500; operate a telephone system; incorporators, C. C. McElwee, H. M. Bentley, C. H. Plymire.

SAINT JOSEPH, ILL.—The Saint Joseph Telephone Company has completed fifty-three miles of wire, with 123 telephones in use. The company is now constructing a line to Sidney.

SPARTA, ILL.—The M. A. Dennis Company, of Sparta, has been granted the right to construct a telephone line along the highways of the county.

STERLING, ILL.—The directors of the Bureau County Independent Telephone Company have decided to issue $45,000, four per cent bonds, interest to be payable semi-annually. The demand that comes from all parts of the county for rapid extension of lines and service calls for money. The $55,000 capital stock, together with the $45,000 to be raised by sale of bonds, will make a total investment of $100,000.

STERLING, ILL.—John Mee is heading a movement to build a telephone line from here to Prophetstown.

SULLIVAN, ILL.—Sullivan Telephone Exchange. Capital stock, $10,000; own and operate local exchange telephone system; incorporators, John R. Pogue, A. O. Harrison, Sarah H. Kirk, John L. Kirk and James L. Kirk.

WAVERLY, ILL.—A new corporation known as the Loami Telephone Company is to construct a toll line from Waverly to Loami, connecting with Maxwell, and to establish a local telephone exchange at Loami. James Prawl will have the work in charge. Messrs. A. C. Moffet, A. L. Hamilton, H. I. DeTurk and W. B. Rogers are the promoters.

VIRGINIA, ILL.—The stockholders of the Virginia and Little Indian Telephone Company have elected M. L. Crum president and J. W. Virgin as acting secretary.

INDIANA.

ALEXANDRIA, IND.—The Alexandria and Elwood Central Union Telephone Exchanges have been consolidated.

BEDFORD, IND.—The council has granted a franchise to the Carter Telephone Company.

BLOOMFIELD, IND.—A new telephone company has been incorporated in Bloomfield by John F. Slinkhard, G. H. Hendron, Ziba P. East and others, for $15,000.

BLOOMFIELD, IND.—W. J. Steckle, the proprietor and manager of the telephone system of this county, has just received three carloads of telephone poles, and will immediately begin the extension of telephone lines between this city and Floris, Drakesville, Pulaski, Savannah, Stiles, Ottumwa, Moulton, Troy and West Grove.

BLOOMINGTON, IND.—By means of the Mitchell Telephone System, Monroe county will have an additional line in operation. The system will connect Bloomington, Smithville, Oolitic, Chapel Hill, Hiltonville, Harodsburg and Brownstown.

BLUFFTON, IND.—Henry Barnhart, president, and W. H. Stevenson, secretary of the Rochester Telephone Company, closed a deal

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with the United Telephone Company of this city for the division of the old Cudahy telegraph line and for the exchange of toll-line service.

CAMDEN, IND.—The Farmers' Mutual Telephone Company has been organized, with Bennie Carnell, of Camden, president; U. E. Tesh, of Camden, vice-president and treasurer; Frank Shanks, of Deer Creek, secretary; E. C. Rice, of Camden, Dr. McNeal and Frank Shanks, trustee; Noah Fouts, east of Camden, Z. L. Truesdell and Dr. Berge, of Camden, were appointed as a committee to draft by-laws.

CARMEL, IND.—Incorporated. The Carmel Mutual Telephone Company, Carmel, Indiana. To operate in Boone and Marion counties. Capital stock, $5,000. Directors, Jonathan Johnson, E. H. Collins, Edwin B. Murphy, Harry Symers and Addison Newlin.

CHRISNEY, IND.—The Home Telephone Company has been organized.

CLARKS HILL, IND.—The Farmers' Coöperative Telephone Company has been organized to compete with the Bell.

ELIZAVILLE, IND.—Incorporated. The Elizaville Coöperative Telephone Company. Capital stock, $400.

FORT WAYNE, IND.—The National Telephone and Telegraph Company, which was purchased from its New York owners on Thursday, was reorganized with the following officers: President, Henry C. Paul; vice-president, Charles S. Bash; secretary, George Trier.

FRANKFORT, IND.—Judge Kent has granted the petition of R. C. Clark, receiver for the Central Energy Telephone Company, to borrow $5,000, the money to be used in completing the plant and bringing it up to its full earning capacity, of about $700 a month.

GREEN'S FORK, IND.—The Green's Fork Cooperative Telephone Company. Capital stock, $4,000.

HAZELRIGG, IND.—The Hazelrigg Coöperative Telephone Company. Incorporated. Capital stock, $500.

KOKOMO, IND.—Reports from Kokomo, Indiana, state that the Jay brothers, of that city, have recently purchased an interest in the Kokomo Independent Telephone Company's plant, which, when completed, will cost $50,000.

MARKLEVILLE, IND.—The Wildwood Telephone Company. Capital stock, $500. Directors, John Biddie, Charles Biddie, Elisha Davis, Lewis Johnson and Charles Fort.

MECHANICSBURG, IND.—The Mechanicsburg, Merkleville and Emporia Telephone Company. Capital stock, $2,000. Directors, Eldred M. Cooper, William Krall, Benjamin Cunningham, William West and Pierce Franklin.

MITCHELL, IND.—The board of trustees of the town of Mitchell has granted a franchise to the Hoosier Telephone Company to extend their line into that city.

NEW PALESTINE, IND.—The Sugarcreek Township Farmers' Telephone Company. Incorporated.

REMINGTON, IND.—The town council of Remington has granted a franchise to the Halleck Telephone Company for an exchange.

SHAWNEE MOUND, IND.—Daniel E. Storms was appointed receiver for the Shawnee Mound Telephone Company, and was required to give bond in the sum of $10,000. The application for the appointment of a receiver was made in the Superior court by Alexander Meharry, one of the directors, and the other gentlemen interested are John W. Gay, John Borum, Arthur H. Evans and Ethan Meharry.

TAYLORSVILLE, IND.—The Taylorsville Telephone Company. Capital stock, $2,000. Directors, Seneca S. Drybread, Benjamin W. Chambers, Edward McSweeney and B. E. Everne.

WABASH, IND.—Grocers of this city have agreed to take out the Bell telephones from their stores, and to use the Home Company's system only hereafter, as the cost of the two systems is held to be too onerous.

WHITELAND, IND.—The town council has granted a franchise to the Strickler Telephone Company, and this will give Whiteland the benefit of both the old and new systems.

WILLOW BRANCH, IND.—The Farmers' Telephone Company, of Hancock county, will have its principal office at Willow Branch, Indiana, until it shall be removed by a two-thirds vote of its stockholders. The capital stock is placed at $10,000, and the directors are Thomas Seamon, Vard Fennell, O. E. Baity, Robert Staley and W. A. Troy.

IOWA.

ADAIR, IOWA.—The Farmers' Telephone Company was organized, and the following named gentlemen were elected officers: M. N. Baker, president; C. H. Dewald, vice-president; O. M. Bovee, secretary; D. Duthie, treasurer. Will build a line from Adair to Berea, Anita and Massena.

ALBION, IOWA.—The Fraley & Arney Telephone Company the other day became a mutual company, hereafter to be known as the Iowa Valley Mutual Telephone Company. W. H. Arney was elected president, Mathias Hauser, secretary, and D. S. Collins, treasurer.

ANITA, IOWA.—A company was organized with Hon. M. N. Baker, president; C. H. DeWald, vice-president; O. M. Bovee, secretary; David Duthie, treasurer. The directors named are James Pilmer, C. P. Christensen, C. C. Caldwell, Charles Armstrong and W. T. Smithers. O. S. Wortman will be business manager and the directors will be the committee on construction.

BELMONT, IOWA.—The Clarion Telephone Company has been granted a franchise by a popular vote.

CARROLL, IOWA.—The New State Telephone and Telegraph Company made an application for a franchise at Carroll, the proposition being voted upon at their election. It was carried by a vote of 550 to 40.

KALONA, IOWA.—The people voted a franchise to the Crow Telephone Company.

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CORNING, IOWA.—Incorporated. The Corning Telephone Company by J. A. Anderson and Frank L. Mercer for $10,000.

GLIDDEN, IOWA.—The North Coon Telephone Company of Glidden, Iowa, is arranging to construct its line.

GREENFIELD, IOWA.—General Manager Bandy, of the Hawkeye Telephone Company, is in Greenfield looking to the securing of a franchise for the establishment of an exchange there.

HUDSON, IOWA.—The Farmers' Mutual Telephone Company has organized by electing the following officers: A. P. Coburn, president; George Wilson, secretary and treasurer.

KEOSAUQUA, IOWA.—The Keosauqua Local Telephone Company has sold its franchise to J. F. Teal, of Stockport, who owns several town exchanges. Mr. Teal proposes to put in a new switchboard and give Keosauqua a first-class exchange.

KEOSAUQUA, IOWA.—The Union Telephone Company has purchased the Keosauqua exchange and will put in new 'phones and overhaul the system there generally. This company now has about fifty miles of line in operation and will soon extend its line to Bonaparte, where it has been granted a franchise.

LOHRVILLE, IOWA.—At the municipal election the proposition to grant franchises to the Central Telephone Company and the E. H. Martin Telephone Company carried overwhelmingly.

MALVERN, IOWA.—H. J. Baird, of Malvern, has leased the telephone exchange in Malvern from the Iowa Telephone Company for a period of ten years, and will also have charge of a telephone exchange to be put in at Strahan and of one to be put in at Emerson.

MAQUOKETA, IOWA.—Articles of incorporation have been filed by the Maquoketa Telephone Company, of Iowa. The company was incorporated by H. T. Brigham, C. B. Miller and others, for $45,000.

MAXWELL, IOWA.—The Maxwell Telephone Company is a new corporation which has filed articles with the Secretary of State. It has a capital stock of $5,000. E. A. Addison, J. A. French, L. C. Sheppard and N. W. Dickson are the promoters.

MITCHELLVILLE, IOWA.—J. W. Hill, of Des Moines, proposes a mutual exchange for Mitchellville, Iowa. A coöperative system is, however, being discussed by some of the business men.

MOUNT AYR, IOWA.—The Consolidated Telephone Company, which is to be organized as soon as one hundred shares of $10 each are subscribed, proposes to put in a central exchange in which the running expenses are to be equally divided among all users, whether in town or country.

MOUNT PLEASANT, IOWA.—The city election gave a telephone franchise to W. J. Steckel and also to the Olds Telephone Company.

OELWEIN, IOWA.—As expected, the Sumner Telephone Company franchise carried at the election by a large majority.

NEW LONDON, IOWA.—The stockholders of the Henry County Telephone Company met and voted to increase the capital stock to $5,000.

OAKLAND, IOWA.—A franchise for the Harlan & Avoca Telephone Company was voted, carrying by sixty votes out of ninety. At Avoca the same company carried by 232 out of 252. At Carson a telephone franchise also carried, sixty-five out of ninety-six.

OLDS, IOWA.—The Olds Telephone Company has recently been incorporated for $1,800 by H. K. Smith, J. W. Brown and others, to operate a local service.

OSKALOOSA, IOWA.—The Home Telephone Company, a corporation of Oskaloosa business men, transferred its interests in the Oskaloosa plant to "The Oskaloosa Home Telephone Company," a large corporation of Eastern capitalists.

Senator H. H. Evans, of Aurora, Illinois, is president of the new company. W. D. Dunsmore of this city, superintendent of the old company, appears with the new company as vice-president and local manager. E. R. Conklin, of Joliet, Illinois, is secretary and general manager of the new company. M. Slusser, of Downers Grove, Illinois, is the treasurer.

The corporation is a wealthy one and has large interests in telephone property in Ohio and Illinois and now it comes to Iowa. The company is in no way interested in or connected with the Bell Telephone Company and is an entirely independent company. The corporation has over $5,000,000 invested in telephone properties in Ohio and Illinois.

PARKERSBURG, IOWA.—Articles of incorporation were filed by the Parkersburg Telephone Company. The capital stock is $10,000. C. G. Bickely, C. F. Bennett, John Secherling, H. W. Wilhelms and Robert F. Camp are the incorporators.

ROCKFORD, IOWA.—O. F. Blaiser, of Greene, Iowa, contemplates establishing a local exchange at Rockford, Iowa.

ROCKFORD, IOWA.—The Shellrock Telephone Company has been working the town of Rockford, Iowa, and has decided to put in a telephone exchange.

SEWAL, IOWA.—Another new telephone company has been organized and starts from Sewal and goes northeast for several miles. It will be known as Sewal & Northeastern Line.

SEYMOUR, IOWA.—The Genoa & Seymour Farmers' Mutual Telephone Company met in Seymour and permanently organized by electing Ed Cole, president; R. N. Shepherd, vice-president; Jim Shepherd, secretary, and C. W. Hays, treasurer.

SIGOURNEY, IOWA.—A mutual telephone company was organized to build a line south and west of Keswick. The officers for the new company are: C. S. Ackley, president; Jared Irwin, secretary, and W. G. Bailey, treasurer.

SPENCER, IOWA.—Incorporated. The Spencer Telephone Company. Capital stock, $15,000.

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SHELDON, IOWA.—The Western Telephone Company has recently acquired the entire stock of the Iowa & Nebraska Telephone Company, the consideration being named as $100,000. The exchanges included are at Sheldon, Sibley, Easterville, Spirit Lake and Cherokee.

STUART, IOWA.—The Lincoln Township Mutual Telephone Company has been organized near Stuart, Iowa, and will serve the Mount Vernon neighborhood and connect with the Hawkeye Telephone Company and the Stuart exchange.

STORY CITY, IOWA.—Articles were filed by the Story City Telephone Company. The capital stock is $10,000. A. M. Henderson is president, J. F. Cogwin, vice-president; W. A. Devendorf, secretary, and Joseph Marvick, treasurer. The company will build a city exchange and will connect with the Story county mutual toll line. F. M. Boardman, of Nevada, will be general manager.

VEDETTE, IOWA.—The farmers east of town met and organized a temporary telephone company. Irving Haughtelin was chosen president, H. G. Thornburg, secretary; John Haughtelin, treasurer.

WAUKON, IOWA.—The Standard Telephone Company will build new farmers' lines. One will run from Village Creek to Lyndale, one thru Hanover township to Waukon, and another thru Union Prairie township into Waukon. Secretary Hager has the matter in charge.

WHEELER, IOWA.—The Farmers' Mutual Independent Telephone Company, of Wheeler Township, has been incorporated.

WILLIAMSBURG, IOWA.—Articles were filed for the Williamsburg Telephone Company, of Williamsburg, with a capital stock of $10,000. The incorporators are A. C. Moon, T. T. Osborn, H. E. Hull, John P. Doherty, M. J. Kelly, G. H. Hughes.

KANSAS.

CONCORDIA, KAS.—W. Teeters, of the Abilene Telephone Company, was in the city looking up the construction of a direct line from there to this place.

ELLIS, KAS.—Incorporated. Ellis Telephone Exchange & Electric Light Company. Capital stock, $2,000.

GREENLEAF, KAS.—Incorporated. Greenleaf Telephone Company, Greenleaf. Capital stock, $10,000.

KINGMAN, KAS.—The Kingman Telephone Company has been chartered with a capital stock of $3,000, its principal backer being B. Albaugh.

RANSOM, KAS.—The Ness County Telephone Company held a meeting at Ransom and completed its organization and now has a full crew of men at work building its line to Ness City and Utica.

SCANDIA, KAS.—Incorporated. The Scandia Telephone Company. Capital stock, $2,000.

WESTMORELAND, KAS.—C. P. Brown and J. E. Smith are arranging to put in a telephone exchange for this city.

WICHITA, KAS.—An ordinance was granted to A. R. Champlin the right to maintain and operate a long-distance telephone exchange in the city.

WICHITA, KAS.—An ordinance granting to the Oklahoma & Kansas Telephone Company the right to maintain a long-distance telephone exchange in the city.

KENTUCKY.

FRANKFORT, KY.—Attorney-General Breckinridge filed suit in the Franklin Circuit Court against the Cumberland Telephone Company asking that the charter of the defendant corporation be revoked and forfeited. The company is charged with having violated section 201 of the Constitution which prohibits common carriers from consolidating with or purchasing or leasing parallel and competing lines.

The style of the case is the Commonwealth against the Cumberland Telegraph and Telephone Company, and the specific acts of the defendant upon which the prosecution is based are the purchase of the old Kentucky Telephone Company, the Lancaster Telephone Company, the Richmond Telephone Company, Paris Telephone Company and Cynthiana Telephone Company, which are described as competing lines. A map showing the same is filed as an exhibit.

HARRODSBURG, KY.—In the United States Court the East Tennessee Telephone Company sought to enjoin J. J. Downey and others from constructing and operating a telephone system in Harrodsburg. The case involves the right of the city of Harrodsburg to grant two telephone franchises. The Court held that an exclusive franchise could not be granted.

HILLSBORO, KY.—The stockholders of the Owingsville & Flemingsburg Telephone Company elected the following officers: U. G. Saunders, president; H. A. Day, treasurer, and M. A. Denton, secretary. The line from here to Flemingsburg is being built now.

MAYSVILLE, KY.—The Maysville Telephone Company has been incorporated with capital stock of $5,000, by James W. Chambers and others.

PARIS, KY.—The Southern Electric Company will shortly establish a telephone exchange in Paris to compete with the Cumberland Company. R. E. Rice, lately with the Cumberland Company, will be manager.

MARYLAND.

BALTIMORE, MD.—The syndicate headed by George R. Webb, known as the United States Telegraph & Telephone Company, has acquired the following properties:

Maryland Telephone & Telegraph Company, capital stock, $1,000,000.

Pittsburgh & Allegheny Telephone Company, capital stock, $1,500,000.

West Pennsylvania Long Distance Telephone Company, capital stock, $1,000,000.

Home Telephone & Electric Company, capital stock, $200,000.

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Allegheny County Telephone Company, capital stock, $200,000.

Hartford County Telephone Company, capital stock, $10,000.

In all about 50,000 telephones, either in actual operation or under contract awaiting installation, will be added to the combination.

CLEAR SPRING, MD.—The Maryland Telephone Company will build a line from Hagerstown to Clear Spring, where it will probably connect with the system to be built in the western portion of Washington county by the newly formed Dry Run Telephone Company.

DRY RUN, MD.—The Dry Run Telephone Company. Newton Kline, treasurer, wants prices on 'phones, wire, insulators and brackets.

MICHIGAN.

ALMA, MICH.—The following officers were elected at the annual meeting of the Union Telephone Company: Directors, G. S. Aldrich, St. Louis; James P. Gibbs, Ithaca; W. O. Mason, Merrill; C. F. Brown, Alma; G. S. Ward, Alma; J. W. Robinson, Vestaburg; Dr. W. P. Gamber, Stanton; F. H. Rockafellow, Carson City; C. H. LaFlamboy, McBride; T. H. Bromley, Jr., St. Johns; J. H. Fildew, St. Johns; F. G. Theirs, Mount Pleasant. Officers: G. S. Aldrich, president; J. H. Fildew, vice-president; C. F. Brown, secretary; G. S. Ward, treasurer. It was decided to amend the articles of incorporation so as to increase the capitalization from $100,000 to $150,000 and expend $50,000 in extending the line from Alma thru to Lansing with solid copper wire. C. O. Trask was retained as general manager. The company has paid a 20 per cent dividend each year since it was organized.

BURR OAK, MICH.—The A. C. Heimebach Telephone Company, of Burr Oak, Michigan, has recently been incorporated for $5,000 and will operate a local system in that town.

Owosso, MICH.—The stockholders of the Owosso Telephone Company held their annual meeting and elected the following officers: President, C. W. Gale; vice-president, Dr. C. McCormick; secretary and treasurer, S. E. Parkill.

MISSOURI.

CLEAR FORK, MO.—Clear Fork Telephone Company, of Cass county. Capital stock, $25,000. Incorporated by D. J. Miller, D. J. Schmock, F. D. Nelson and others.

FARINA, MO.—The Farina & Vandalia Telephone Company has been granted permission to install a telephone system between Vernon and Patoka, in Marion county, and Vandalia, in Fayette county. The capital stock has been increased from $2,500 to $5,000.

HANNIBAL, MO.—Incorporated: The Miller Township & Hannibal Telephone Company, of Hannibal. Capital stock, $2,000. Incorporated by Joseph E. Rowe, H. Clay Whaley, Beverly E. Hixon and others.

HANNIBAL, MO.—The city council at Quincy, Illinois, has passed an ordinance granting the right of way into Quincy to the Adams & Pike Counties & Hannibal Telephone Company. The new line is completed as far as Fall Creek. It has connections with Marblehead, Fall Creek, Payson, Liberty, Kinderhook, Hull, Seehora, Clayton, Siloam Springs, Kellerville, Camp Point, Mount Sterling, Perry, Versailles, Chambersburg, Rushville, Jacksonville, Beardstown.

MONTGOMERY CITY, MO.—Recently incorporated the People's Telephone Company, of Montgomery county, with a capital stock of $3,100. The organizers are H. Ellis, T. Marlow, W. Crane and others.

REPUBLIC, MO.—T. W. Wade has organized a farmers' line which will be known as the Great Western Mutual Telephone Company.

SEDALIA, MO.—The articles of incorporation of the Queen City Telephone Company, now installing a system in Sedalia, show that the stock is divided into 500 shares of the value of $100 each. Gilbert Chaddock, of Los Angeles, California, holds three shares; Charles A. Chaddock, 297; Frederick A. Churchill, 189; H. M. Dix, 10; George R. Henderson, 1. The last four parties reside in Saint Louis.

SAINT LOUIS, MO.—Col. J. H. Allen, of Saint Louis, has been granted permission by the Bond county, Illinois, supervisors to construct a telephone line in that county. He intends to connect by telephone the towns of Greenville, Smithboro, Woburn, Mulberry Grove, Pleasant Mound, Hookdale, Tamalco, Keysport, Beaver Creek, Dudleyville and other towns.

VERSAILLES, MO.—The Versailles Telephone Company. Capital stock, $5,000. Incorporators, William E. Straus, Edward Weidenbach, A. Hopper and others.

MINNESOTA.

ADA, MINN.—The Ada & Twin Valley Telephone Company will extend its toll lines.

BLOOMING PRAIRIE, MINN.—A new telephone company has been organized in this county. It is termed The Steele County Telephone Company and its headquarters are in the village of Blooming Prairie. Its incorporators are O. P. Rask, S. A. Rask, A. A. Peterson and G. A. Peterson, of Blooming Prairie, and Edward H. Allen, of La Crosse, Wisconsin. The capital stock of the company is placed at $10,000.

DULUTH, MINN.—The People's Telephone Company of this city and the Zenith Company of Duluth, working in conjunction, are planning for the construction of long-distance lines in several directions, and as a step toward that end papers have been filed incorporating the Northern Electric Construction Company, whose object is the construction and maintenance of telephone, telegraph lines and power plants. The incorporators are R. C. Ogilvie, J. C. Crowley and W. J. Vrooman.

EDGERTON, MINN.—The Enterprise Telephone Company of Edgerton, Pipestone county, has filed articles of incorporation, and fixes its capital stock at $50,000. The di-

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rectors are Edward Yocum, William Lockwood, C. G. Brady, C. S. Howard and E. W. Davies.

ELBOW LAKE, MINN.—Articles of incorporation of the Elbow Lake Telephone Company of Elbow Lake, with a capital stock of $10,000, were filed with Henry Sampson, E. J. Scofield, T. E. Dybdel, F. V. Barnes and W. E. Landeene as incorporators.

GRAND RAPIDS, MINN.—The Minnesota Telephone & Electric Light Company, successor to the Northern Minnesota Telephone Company, was incorporated in the city of Wadena, with A. B. Kerlin, president of the former company, elected as president, and W. R. Baumbach, treasurer. Mr. Kerlin will be in Grand Rapids in a few days for the purpose of installing the telephone system, for which he has a franchise.

KENYON, MINN.—The village council has granted a telephone franchise to J. A. Gates.

KERKHOVEN, MINN.—The Kerkhoven & Hayes Telephone Company has been formed at Kerkhoven, Minn.

MINNEAPOLIS, MINN.—Judge Elliott has issued an order discharging Edward E. Webster from the receivership of the Mississippi Valley Telephone Company. The certified checks settling the last claims against the company have been left in charge of the clerk of the court.

NEW PAYNESVILLE, MINN.— D. N. Tallman has purchased the local telephone exchange at New Paynesville.

WINONA, MINN.—The Winona Telephone Company has elected the following officers: President, James A. Tawney; vice-president, John Dietze; secretary and treasurer, Otto Troost, Jr.

NEBRASKA.

DODGE, NEB. — The Farmers' Telephone Company, of Dodge, has been formed.

FREMONT, NEB.— E. J. Scott has been elected manager of the new mutual telephone company, which has been organized by the farmers in the central portion of the county. He has been instructed to go ahead and purchase materials for the new line.

LIBERTY, NEB.—The Liberty Independent Telephone Company. Capital stock, $5,000. Officers: President, George Sutter; vice-president, C. D. Matthews; secretary, R. T. Moore; treasurer, G. L. Meissner.

ST. ANSGAR, NEB.—The St. Ansgar Telephone Exchange Company has been incorporated, with $10,000 capital stock, to build telephone lines in Mitchell county. The incorporators are R. C. Suberius, Martin Moe and S. J. Pishek.

NEW JERSEY.

EAST ORANGE, N. J.— American Home Telephone Company. Principal office, New Jersey Registration & Trust Co. building, East Orange, N. J. Object, general telephone business; capital stock, $2,000,000; incorporators, Alfred G. Brown, Edward B. Hawkins, Edward T. Magoffin.

NEW BRUNSWICK, N. J.— The Seaboard Telephone Company is organized for the purpose of operating a telegraph and telephone line in the vicinity of Perth Amboy, and its main office will be at 148 Smith street, in that city, and in charge of James H. Voris.

The company has a capital stock of $10,000, divided into 400 shares at $25 each. Business will be commenced with one-third of the capital stock. Each of the stockholders has $675 invested. They are all residents of Perth Amboy, and are Charles K. Seaman, James M. Glenn, William H. McCormick, William B. Pratt and James H. Voris.

PATERSON, N. J.—The entire plant of the Paterson, Passaic & Suburban Telephone Company will in all probability be sold to Philadelphia capitalists. They represent the company that controls the telephone system of Trenton, N. J., Chester and Delaware counties, and of Easton, Allentown and Reading, Pa. They have been trying to reach New York for a long time, but were blocked at Newark and Jersey City by the Bell Company. If they can secure the local concern they can use its franchises thru Passaic and Rutherford and gain the desired end.

PERTH AMBOY, N. J.— Seaboard Telephone Company. Principal office, 148 Smith street, Perth Amboy, N. J.; object, telephone business; capital stock, $10,000; incorporators, Charles K. Seaman, James M. Glenn, William H. McCormick, William B. Bratt, James H. Voris.

NEW YORK.

BINGHAMTON, N. Y.— The independent Telephone Company is coming rapidly to the front. The directors held a meeting and elected George C. Bayless, president; T. B. Crary, treasurer, and James H. Roberts, secretary. It was decided to increase the capital stock from $100,000 to $150,000, and to issue $150,000 worth of bonds.

BURLINGTON FLATS, N. Y.—The Burlington Flats Telephone Company will build a line to connect with the Wharton Valley line at West Exeter, to West Winfield and Utica.

DAYTON, N. Y.—A local telephone company has been formed to connect with the long-distance telephone; James E. Bixby as manager, and J. J. Volk as secretary and treasurer.

EAST RANDOLPH, N. Y.—J. A. Hall has secured the franchise to extend his telephone line to Randolph.

GIBSON, N. Y.—The Consolidated Telephone Company held a meeting at Gibson. The following delegates were in attendance: Harford, Elmer J. Whitney, Edward Watson and Dr. H. Hoover; South Gibson, L. Manzer, S. James, H. D. Pickering and David Michaels; Gibson, E. Sweet, P. M. Barrett, George Hurlburt, G. R. Stiles and W. J. Lamb. They elected the following officers: President, E. A. Sweet; vice-president, W. E. Maxey, of South Gibson; secretary, Elmer J. Whitney, of Harford; treasurer, F. W. Barrett. They are going to extend the line to Scranton, via Carbondale.

JAMESTOWN, N. Y.—Telephone competition will soon be inaugurated in Jamestown. New

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York, and the Jamestown & Chautauqua Telephone Company has been granted a franchise to do business in that city.

LITTLE FALLS, N. Y.—Arrangements are being made to extend a number of the Interstate Telephone Company's lines into the country surrounding Little Falls. New exchanges are to be built at St. Johnsville, Fort Plain and Canajoharie, connecting there with the Glen Telephone Company, giving direct communication thru to Johnstown and Gloversville. George C. Hakes, formerly secretary and manager of the County Telephone Company of Herkimer, will be the new manager.

LIVONIA, N. Y.—Livonia Telephone Company, incorporated; capital stock, $1,000; directors: E. A. Bronson, C. E. Hartson and W. B. Thurston, Livonia.

NEWBURGH, N. Y.—The contract for constructing the plant of the Colonial Telephone Company of this city has been awarded to the Columbian Contracting Company of New York. The new telephone system is to be in operation within six months. The officers of the Colonial are: S. V. Schoonmaker, president; W. G. Taggart, vice-president; Charles D. Robinson, secretary; H. A. Bartlett, treasurer.

ATTICA, N. Y.—The Central New York Telephone and Telegraph Company of Utica has filed with the Secretary of State a certificate of increase of capital stock from $800,000 to $1,000,000. The company has a paid-in capital of $800,000, and debts and liabilities of $210,967. The certificate is signed for the company by B. H. Lawrence and Francis Wood.

WARSAW, N. Y.—Warsaw trustees have granted a franchise to the Independent Union Telephone Company for the establishment of an exchange in that place.

OHIO.

ATHENS, OHIO—The Union Telephone Company, Athens, increase of capital stock from $15,000 to $50,000.

BRIDGEPORT, OHIO—The Belmont Telephone Company of Bridgeport, increased its capital stock from $15,000 to $75,000. J. C. Heinlein is the president and Andrew Heinlein the secretary.

BARNESVILLE, OHIO—A. H. Doudna has resigned his position with the Central District & Printing Telegraph Company to accept a more lucrative place with the Belmont Telephone Company, the new organization which will soon erect lines in Barnesville. Mr. Doudna will be superintendent of all the company's territory west of St. Clairsville.

CAMBRIDGE, OHIO—A union telephone company has been organized in Oxford township, this county, with a capital stock of $10,000, with the following officers: O. V. Wells, president; J. W. Rose, vice-president; E. B. Shipley, treasurer; J. B. Giffee and B. F. Sheppard, general managers.

FINDLAY, OHIO—The Home Telephone Company of Findlay has made arrangements to put in sub-exchanges at Arcadia, Benton Ridge, Mount Cory, Van Buren and Arlington. All will be connected with the main office, and the farmers' telephones will be connected along the lines. It is the intention of the company to make a first-class county plant.

HAMILTON, OHIO—The county commissioners have granted to John Miller and Ezra Bourne, Jr., a franchise over the Oxford and Brookville pike for the construction of a telephone line from Oxford to Mixerville, Indiana.

HILLSBORO, OHIO—The Hillsboro Telephone Company has increased its capital stock from $10,000 to $30,000.

JACKSON, OHIO—Ed L. Sternberger has organized the Jackson County Home Telephone Company, with a capital stock of $50,000. The officers are as follows: Ira A. Sternberger, president; H. S. Willard, first vice-president; W. D. Hippel, second vice-president; M. D. Jones, secretary; T. J. Morgan, treasurer; J. W. Dusenburg, manager.

LOWELLVILLE, OHIO—The Lowellville council passed an ordinance granting a franchise for telephone service to the Youngstown Telephone Company.

LONDON, OHIO—The Madison-Clarke Telephone Company, with headquarters at London, was incorporated, with capital stock of $75,000, by W. M. Jories, J. F. Rankin, R. W. Boyd, J. C. McMillam, E. L. Barber and A. S. Bell. The company will build and operate telephone lines in Madison, Clark, Green and Fayette counties.

MIDDLEBOURNE, OHIO—A telephone company is being promoted at Middlebourne and Hendrysburg to build to Barnesville, where it will connect with other independent lines. O. V. Wells is president of the company; J. W. Rose, vice-president; E. B. Shipley, treasurer, and J. B. Giffee and B. F. Sheppard, general managers.

MIDDLETOWN, OHIO—The Citizens' Telephone Company, with a capital stock of $10,000, is organized for the purpose of doing a general telephone business in Butler, Preble and Montgomery counties. The incorporators are Charles E. Margerum, Charles Goldman, W. H. Johnson, Charles Barkelew and Charles W. Faber.

MONROEVILLE, OHIO—Messrs. Frank H. Knapp and C. R. Callaghan, of Bellevue, have been negotiating for the purchase and transfer of the Huron County Telephone Company, including their exchanges and good will. This company owns and operates exchanges at Monroeville, Chicago Junction and Plymouth, together with fifty miles of toll line. The Huron County Company will have a paid-up capital of $30,000. It will be reorganized, and Bellevue, Monroeville and Cleveland parties will be interested.

OXFORD, OHIO—The county commissioners granted to John P. Miles and Ezra Bourne, Jr., a franchise over the Oxford and Brookville free turnpike from Oxford to the State line, for the construction of a telephone line from Oxford to Mixerville, Ind.

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OTTAWA, OHIO—The Putnam Telephone Company of Ottawa increased its capital stock from $40,000 to $100,000. G. W. Riser is president, and C. B. N. E. Matthews secretary.

WEST MILTON, OHIO—The Progress Telephone & Telegraph Company of West Milton, Ohio, has increased its capital stock from $10,000 to $30,000.

WAVERLY, OHIO—An ordinance was passed granting a franchise to the Ohio Telephone & Telegraph Company, giving it the use of the public ways of the city for the construction of its lines, etc. The object of the company, as stated, is to build a new long-distance line reaching from the seacoast in Virginia, striking Ohio at Marietta, and coming thru here to Chicago, parallel with the Bell line and connecting with the Home office.

ZENIA, OHIO—The city council granted a franchise to operate a long-distance telephone service to the Ohio Telephone Company.

PENNSYLVANIA.

ASHLAND, PA.—A deal is made by which the Schuylkill Telephone Company is absorbed by the United Telegraph & Telephone Company, which aims to absorb all the independent companies, and has already secured twelve. The price paid for the Schuylkill property was $218,750.

ALTOONA, PA.—S. P. Light and W. B. Barnard, directors of the United Telephone & Telegraph Company, of Philadelphia, bought the Altoona-Phœnix Telephone Company. The purchasers will connect the local system with their recent purchases in Montgomery, Chester, Delaware, Lancaster, Lebanon, Northumberland, Montour, Columbia, Union and Lycoming counties.

GETTYSBURG, PA.—The town council of Gettysburg granted a franchise to the Pennsylvania Telephone Company to build a branch line in that place.

HANOVER, PA.—T. J. O'Neal, G. D. Gitt and H. N. Gitt, of this place, and S. L. Johns, of McSherrystown, the capitalists composing the syndicate which recently purchased the Hanover Telephone Company, bought the majority of the shares of stock of the Adams County Telephone Company, paying $36 per share, the par value of which is $25. The company owns and operates a complete telephone service thruout Adams county, with headquarters at Gettysburg, has a surplus in the treasury of $1,750, and has no debts.

LANCASTER, PA.—The Independent Telephone Company of Lancaster county is absorbed by the United Telephone & Telegraph Company of Pennsylvania, the last of the purchase money having been paid. Thru Eugene G. Smith, of this city, $50,000 of the purchase price was paid on March 8. The officers of the local company resigned and in their stead the following were elected: President, Edward Davis, Philadelphia; secretary and treasurer, F. E. Smith, Philadelphia; directors, W. D. Barnard and E. M. Yarnell, Philadelphia; R. G. Park, Merion; F. G. Hobson, Norristown; Hon. Ward R. Bliss, Chester; G. R. Van Alen, Northumberland; C. M. Clement, Sunbury; S. P. and H. P. Light, Lebanon; H. J. Harner and W. H. Hartman, Lancaster. The purchasers are now in possession of the local companies in a dozen counties in eastern Pennsylvania, and are gradually extending their system in the East to New York, and becoming a rival of the Bell.

SPRING CITY, PA.—The Chester County Telephone Company passed into the hands of the syndicate known as the United Companies, of which Richard G. Park is president. The capital stock of the company consists of twelve hundred shares, which at par would be valued at $60,000. The company since its organization has been doing a fair business; its service has been extended constantly until at present almost every section of the county can be reached by the Chester County Company's lines.

TENNESSEE.

ALEXANDRIA, TENN.—The Gainesboro Telephone Company has purchased from Overall Brothers & Parker what is known as the DeKalb County Line, extending from Smithville to Alexandria, Tenn., and including the exchange at the former place. The consideration was $2,000.

CAMDEN, TENN.—Granted, a charter to the Camden Telephone Company, with $1,000 capital stock. The incorporators are: W. L. Morris, T. J. Lowry, W. P. McGill, U. A. Potts and D. G. Hudson.

COOKEVILLE, TENN.—The stockholders of the Overton Telephone Company met at Livingston and a complete reorganization of the company was effected. The capital stock of the company was increased from $5,000 to $20,000. All of the old officers of the company tendered their resignations and a new set of officers were elected, the newly elected officers being distributed over Overton, Putnam and Jackson counties. The following are the new officers: President, Jere Whitson, Cookeville; vice-president, Dr. S. B. Fowler, Gainesboro; secretary, and auditor, H. D. Whitson, Cookeville; treasurer, H. R. Vaughan, Livingston; general manager, Harris Hatcher, Eagle Creek; superintendent of line construction, R. H. Hankins, Livingston; assistant superintendent of line construction, M. H. Hankins, Livingston; assistant general manager, R. L. Draper, Gainesboro. The office of the company will be located at Cookeville. This company expects to construct 300 miles of telephone within the next twelve months, and will put in an exchange in this city at once; also at Monterey, Algood and Mine Lick, in this county, as well as at the other leading towns of this section of the State.

FAIRVIEW, TENN.—The Fairview Telephone Company has been chartered, with capital of $1,250, by H. F. Tilghman, J. C. Paris, W. A. Minton and others.

MCMINNVILLE, TENN.—The McMinnville Telephone Exchange, with fifty-five miles of

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toll lines running thruout Warren and several other counties, has been purchased by the Cumberland Telephone Company. It will be operated at once by that system.

SPARTA, TENN.—The Smithville Telephone Company's lines and exchanges have just been purchased by the Gainesboro Telephone Company by Manager Cox of this place. A number of exchanges at Liberty, Alexandria and Woodbury will be put in at once and lines extended all over the counties, boxes being put in at every postoffice.

TEXAS.

CALDWELL, TEX.—The Trans-Texas Telephone Company has acquired the exchange at Caldwell.

CLARENDON, TEX.—The Clarendon Telephone Company has been incorporated, with capital stock of $3,000, by R. W. Talley, John M. Clower, J. D. Stocking and A. M. Beville.

CLEBURNE, TEX.—The Independent Telephone Company of Waco requests a franchise to erect and operate a system here. Judge J. Bayless Earle, of Waco, general manager of the company, says the new company intends to build lines from that city to Hillsboro, Corsicana, Temple, Belton, Gatesville, Cleburne and other points at once, completely establishing a long-distance service.

CUMBY, TEX.—The Hopkins County Telephone Company was recently organized in Cumby, Texas, with a capital stock of $1,000. The company will string lines over the county and also establish an exchange at Cumby.

EMORY, TEX.—A company has been organized for the purpose of building local telephone lines to different parts of Rains county. The capital stock is $1,000, which has all been taken.

FULDA, TEX.—Bellah Telephone Company, of Fulda, Baylor county; capital stock, $2,100. Incorporated by Sam Bellah, Sidney Webb and W. E. Kaufman.

MABANK, TEX.—The Boyett & Smith telephone lines were purchased by the Kemp & Kaufman Telephone Company, of Kemp. By this deal the purchasers will now control over a hundred miles of wire, extending from Kaufman to Athens, and from Corsicana to Tyler, with branch lines from Mabank to Prairieville, Roddy and Paynes Springs.

MACOMB, TEX.—The Macomb Telephone Line is completed. New officers as follows: J. Ketels, president; F. M. Weightman, vice-president; A. E. McWilliams, secretary; W. B. Brewster, treasurer.

MARBLE FALLS, TEX.—The Martin Telephone Company is putting in an exchange here.

MOUNT VERNON, TEX.—The telephone system here has exchanged hands, having been purchased by Arthur Majors & Co., of this place. It is said that a line will be run from this place by the way of Hogansport to Sulphur Bluff, in Hopkins county, a distance of about twenty-five miles.

ORANGE, TEX.—W. D. Bettis, of Orange, and M. D. Shaw, of Iowa, have received franchise for construction of a telephone system in Orange.

RICHARDSON, TEX.—A telephone company, with a capital stock of $750, has been organized. C. H. Blewett is president of the company, Sam Harben secretary, and William Guion treasurer.

PARIS, TEX.—Mr. F. B. McElroy, of Sherman, contemplates putting in a telephone system in Paris, having asked for a franchise. He says the indications are very favorable that the franchise will be granted.

SHERMAN, TEX.—Grayson County Telephone Company, of Sherman, capital stock, $150,000. Purpose: To construct, acquire, maintain and operate telephone exchanges and telephone lines in Grayson county, including the cities of Denison and Sherman. Incorporated by James S. Brailer, of Ohio; W. A. Armstrong, F. B. McElroy, of Sherman; R. S. Legate, of Denison; Z. B. Campbell, of San Antonio; James King Duffy, of New York, and C. N. Haskins, of Ottawa, Ohio.

SMITHVILLE, TEX.—The directors of the Smithville & Red Rock Telephone Company, Smithville, Texas, have declared a dividend of 45 per cent.

TEMPLE, TEX.—The Bell County Telephone Company. Capital stock, $120,000. Incorporators: James King Duffy, New York city; James S. Brailer, Wauseon, Ohio; Z. B. Campbell, San Antonio; C. N. Haskell Ottawa, Ohio; J. B. Earle, J. E. Boynton, Waco; H. M. Dougherty, Columbus, Ohio.

VERMONT.

MONTPELIER, VT.—The Washington County Telephone Company held a meeting and elected a board of seven directors as follows: E. W. Bisbee, George Lamson, B. W. Hooker, Donald Smith, Homer Fitts, D. M. Miles and S. D. Allen. The executive committee reported the progress made to the present, and it was unanimously voted to go ahead and put in a telephone system as originally outlined.

WEST BURKE, VT.—A village telephone company has been organized here, with Henry Mouton as president, Perry Paster, secretary and agent, and David Smith, treasurer. More than forty names are already on the list for service, and many more intend to subscribe this season. The scheme is that any citizen may connect with the main line by purchasing his own machine. Two companies are represented in town now—the old line and the People's.

WISCONSIN.

CLINTON, WIS.—The present directors of the Clinton Telephone Company are H. A. Moehlenpah, O. L. Woodward, C. W. Collver, Iver Jacobson, B. Snyder, A. V. Peters and J. F. Kemmerer.

DODGEVILLE, WIS.—A new telephone company was organized here, which will be known as the Dodgeville & Union Mills Telephone Company, and which will run its line from this city to Union Mills, connecting with

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the Union Telephone Company's lines here. The following officers were elected: President, James Gardner; treasurer, John Rowe, Jr.; secretary, L. N. Reddle.

FOND DU LAC, WIS.—A meeting of the directors of the Little Wolf River Telephone Company was held here. Those present were Leander Choate and H. L. Sweet, Oshkosh; O. A. Weiggand, Shawano; A. L. Hutchinson, Weyauwega; John T. Boyle, F. H. Sweet and S. D. Boreham, Fond du Lac.

FORT ATKINSON, WIS.—The Jefferson County Telephone Company will increase its capital stock to $10,000. Arthur M. Webb, secretary.

INDEPENDENCE, WIS.—The Trempealeau & Buffalo County Telephone Company have received their papers of incorporation. The officers of the company are: C. H. Cooke, president; Edward Jackson, secretary; Ole Pederson, treasurer, and A. J. Bautch, general manager. The line will run from here to Gilmanton. Work will commence in about a week.

LA CROSSE, WIS.—A company has been organized to manufacture M. I. Vought's independent telephone, which has proved a splendid invention. Marcy Berger and M. I. Vought are the members of the corporation.

NEENAH-MENASHA, WIS.—Franchises have been granted by the cities of Neenah and Menasha to the Fox River Telephone Company to establish and maintain telephone exchanges in each city. The Fox River Valley lines at present embrace the cities of Kaukauna, Appleton, Little Chute and Dale. It is connected directly with the Wolf River Company, which has exchanges at New London, Waupaca and other cities in Waupaca county. The Little Wolf River Company is another independent company with which the Fox River lines are connected. This branch has sixty-six villages and cities on its circuit.

PARDEVILLE, WIS.—F. H. Smith has been granted a telephone franchise.

RHINELANDER, WIS.—A company has been formed under the name of the Rhinelander Mutual Telephone Company, and a franchise has been applied for. The officers of the company are: President, Sam S. Miller; vice-president, W. E. Brown; secretary, Arthur Taylor; treasurer, M. H. Raymond. Specifications for a plant are now being drawn by A. W. Bryant, of Grand Rapids, an electrical engineer, who originated the movement here. One hundred and eight 'phones have already been subscribed for and it is the intention of the company to construct a 200 'phone exchange, with a switchboard capacity of 400 'phones.

RIO, WIS.—A new company in Rio, Wisconsin, will be known as the People's Telephone Company. Mr. J. S. Farrington, the previous owner of the local system, sold his lines, franchises and equipments to the new company. Mr. Farrington was elected president and manager; J. F. Robertson, vice-president; E. E. Marsh, secretary.

STANLEY, WIS.—A telephone franchise has been granted to Ole J. Jensen.

SHEBOYGAN, WIS.—The Northwestern Telephone & Electric Company has applied for a franchise.

OTHER STATES.

CADDO, I. T.—The Choctaw Telephone Company was incorporated, with A. M. Robertson manager. The company is composed of Caddo men and has bought the Hodges long-distance line, and will put in a local system here. The capital stock is $25,000, and the company is a strong one, including H. M. Dunlap, president of the Caddo bank.

BELGRADE, ME.—The Dirigo Telephone Company will connect up its lines from Belgrade to Lisbon, Lisbon Falls, Shiloh, via Augusta and Hallowell, bringing it within twenty-five miles of Portland wards eight and nine, where an exchange will be established. The company expects to install between two and three hundred 'phones on this extension.

MERIDIAN, MISS.—A cross-arm factory for the manufacture of cross-arms for telephone and electric-light poles, has been established in Meridian by J. M. Brownlee, J. H. Kittermaster and W. C. Fulvoye.

BILLINGS, MONT.—The Billings Telephone Company has been reorganized and will continue in business. Some extensive improvements are planned.

WILTON, N. H.—The Wilton Telephone Company has increased its capital stock to $5,000.

PAISLEY, ORE.—The Lake County Telephone & Telegraph Company organized at Paisley.

WINTHROP, ORE.—The People's Independent Telephone Company, of Winthrop, incorporated. The capital stock is $10,000.

WESTERLY, R. I.—The town council granted a franchise to the Westerly Automatic Telephone Company.

PASS CREEK, WASH.—The Pass Creek Telephone Company has completed the final arrangements for establishing the line from Boseman to Pass Creek, a distance of thirty miles.

SEATTLE, WASH.—John Smoulter, a banker of Wilkesbarre, Pennsylvania, has a large financial interest in the new Independent Telephone Company. He says that work will begin at once and that the system will be carried thru Washington to Portland and eventually to California.

HINTON, W. VA.—Trustee R. F. Dunlap, at Hinton, sold the Hinton Consolidated Telephone Company, including the Red Sulphur, Peterstown and Union branch. The property was bid in at $3,900. Five-eighths of the interests bought are now owned by leading stockholders of the Greenbrier & Organ Cave Telephone Company, and a movement is afoot to consolidate these lines. Details have not yet been perfected.

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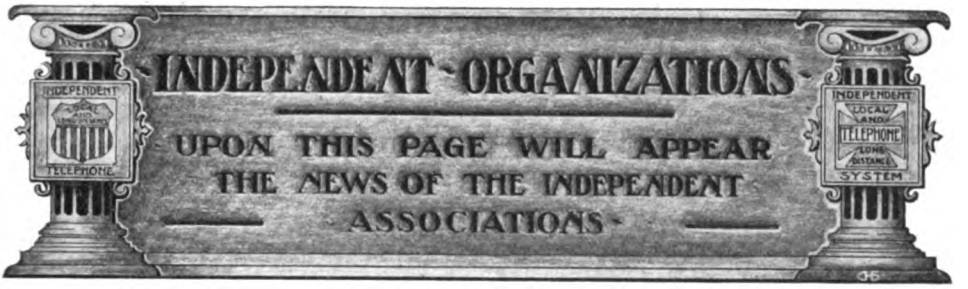

THE NATIONAL INDEPENDENT TELEPHONE ASSOCIATION.

The National Independent Telephone Association of the United States will convene at Buffalo, New York, United States of America, on June 11, 1901, at the Pan-American Exposition grounds. The program of the meeting we will announce in the June issue of this paper. Judge J. M. Thomas, president of the National Association, says as follows: "We have just determined to hold the fifth annual convention of the Independent Telephone Association of the United States of America at the Pan-American Exposition grounds, city of Buffalo, June 11, 12 and 13. The program for the meeting will be arranged later. The matter of transportation has been arranged by the Pan-American Exposition with all the railroads to carry visitors at one-and-one-third fare for the round trip. The general committee is composed of Samuel E. Weyland, Scranton, Pennsylvania, together with Robert R. Hefford and Clark L. Ingham, of Buffalo; these gentlemen will secure special rates at all hotels for those attending the convention. It would be advisable for intending visitors to notify this committee in advance so that the necessary accommodation can be reserved. In choosing Buffalo as the convention city during the Exposition the association has been wise in its selection, as the city of Buffalo will at this time afford numerous attractions for the visitors, together with the fact that a number of the leading telephone manufacturers have exhibits at the Exposition. Telephone dealers will have an opportunity to display their product to the members of the association better than ever, for when the convention has been held in the different cities it only permitted a limited display of apparatus, and then again, the manufacturers could not afford to fit up a very elaborate display for a few days. The Exposition being open during a period of seven months warrants the manufacturer in making a complete display which should be of unusual interest to the members of the association.

OHIO CONVENTION OF THE STATE INDEPENDENT TELEPHONE ASSOCIATION.

Six years ago, at the Chittenden Hotel, Columbus, Ohio, a half dozen representatives of all the independent interests in the State formed the first independent State telephone association in the country.

That association, now known as the Ohio Independent Telephone Association, held its sixth annual convention at the same hotel, Friday, April 5. There were 125 delegates representing 86 of the 201 independent companies of the State.

These 86 companies operate 42,000 phones and 4,400 miles of toll lines, which represent almost exactly one-half of the total number of 'phones and miles of toll lines now operated by the independent exchanges of Ohio.

The first session was opened by Judge Thomas, President of the National Independent Association, who in a few well-chosen words introduced H. A. Lanman, president of the Columbus Citizens Telephone Company as the host of the day, who said:

"It was a community of interests that brought into existence the Ohio Telephone Association — born as the result of a menace from a gigantic monopoly who were not content alone to cast a shadow upon its securities, but with an

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upheld club in the so-called Berliner patent, were ready to beat out the life of any one who might enter the field of fair competition. Since our meeting in Cleveland, one year ago, this club has been broken. Our honored president, Judge Thomas, and our secretary, Mr. Critchfield, have not only served this organization efficiently in convincing the Supreme Court of the invalidity of the Berliner patents, but they are entitled to the lasting gratitude of all the people of the country who have been paying unjust tribute — not to a deserving inventor, as contemplated by the patent law, but to a band of speculators and adventurers who have been holding up the country under outrageously false pretenses. The community of interests of which I have spoken has in addition to the material, also a social side — and it is with reference to the latter that, as representative of our local company, the Columbus Citizens', I wish to assure you that we are glad that in selecting a meeting place you were good enough to come to Columbus, and on behalf of the directors and management of our company it is my pleasure to assure you that you are, one and all, most cordially and heartily welcome."

John Y. Russell, secretary of the Columbus Board of Trade, was then introduced, and delivered a short but eloquent address on behalf of the organization which he represented. He referred to the promoters of telephone enterprises as being among the greatest benefactors of recent civilization. He predicted that the day was not far distant when the telephone would penetrate every portion of the globe and that the time would soon come when human utterances could be sent around the world in forty seconds. He expressed great pleasure at the fact that the first independent association had been organized in this city, and welcomed the members back to Columbus.

Judge Thomas responded to the two addresses of welcome and gave a short history of the independent movement. He said that the original meeting held in the same hall in May, 1895, showed a striking contrast to the present session. At that time there were not more than a dozen independent companies in the State, and the meeting was held behind locked doors, for fear that the opposition would learn their plans.

"Those were the dark days of telephony," said he, "and to the organization effected at that time belongs the credit for the organized efforts in all portions of the country. If the independent companies had been allowed to run loose, I firmly believe we would not be in the business at the present time. Therefore, for the sake of old times we are especially glad to come back to Columbus.

"At that time there was no independent company in Columbus. Soon after Mr. Lanman and his associates assembled behind barred doors and determined to make an effort for an independent company in this city. But it was not for several years, after one of the hardest fights in the history of telephony, and the expenditure of immense sums by the opposition, that the franchise was finally secured. Today, as you all know, the Columbus Company is one of the largest and most successful in the country. I see no reason why we should not always meet here to discuss matters of business and form new plans for the improvement of the business which has grown great in those few years since that time."

The first paper on the program was read by Kora F. Briggs, secretary and manager of the Home Telephone Company of Tiffin, Ohio, whose subject was, "Our Farmer Patrons," and which proved a most interesting paper. He said:

"The first question which arises in the minds of those who are contemplating extending their lines to the country, is: Will it pay? After an experience of nearly three years with farmers' lines, I am prepared to assure you that they do pay. The rentals received therefrom will pay upon the investment necessary for their construction, 20 per cent gross earnings, and will add, on an average, three subscribers in town to every one installed on a farm, and this latter feature would make the investment a good one, even if the country lines did not more than pay the cost of

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operation and 6 per cent on the money necessary for their construction. You will find also that the farmers will ever be the most prompt paying subscribers, many of them paying from six months to a year in advance.

"The question of the rentals to be charged to these country patrons is one upon which the independent telephone companies of this State widely differ, and it would be for the common good if an agreement could be entered into whereby the same prices would prevail thruout the State. But it is probably too early in the independent development to expect concerted action along this line at this time. In most localities the telephone companies will experience little difficulty in securing contracts among farmers for six party lines at $18 per year, for the full privileges of the exchange, the same as granted to town subscribers. We require the farmers to do all the soliciting themselves, and to bring to us the requisite number of five-year contracts already signed, and also to procure for the company all the necessary right of way.

"When figuring upon the rate to be charged, we estimate the cost of construction of the proposed line, and make rates sufficiently high that the gross income from the initial number of subscribers on the line would be 20 per cent, figuring 6 per cent for the investment, 6 per cent for operation, and 8 per cent for depreciation. For example, if the proposed line is four miles long, it will cost approximately $500 to build it, and equip it with instruments; 20 per cent on the cost would be $100. Hence, if we can put eight subscribers on the one circuit, we make them a rate of $12 per annum each, which gives us practically 20 per cent gross income. The sequel will show that inside of two years we will have two more circuits of eight telephones each, or twenty-four subscribers on that lead, and that for the last sixteen we have had no expense for pole-line construction, as we require the farmer to erect, or pay the cost of erecting the lateral pole line leading from his house to the main line.

"Our experience has been that it pays to build a good substantial line of 25-ft. poles with 6-inch tops, and use 10-pin cross-arms for at least four miles from the exchange. Beyond that distance it is sometimes advisable to use 6-pin arms, but it always pays to look a long way into the future when you are building for telephone service. We use No. 14 B. B. double galvanized iron wire, the same as we use in the local exchange, and find that it gives good service to farmers living eight miles from the exchange, with occasional transpositions. All instruments should be bridged with 1600-ohm ringer, and equipped with "straight-way" generators. Our first farmers' lines were equipped with ordinary 1600-ohm bridged ringers, and they give fairly satisfactory service, but the frequent ringing was a source of much annoyance. A short time since we installed an eight-party line with "straight-way" generators, which allows the subscriber to signal central without ringing any of his associates on the line, and it is proving so popular that we shall be under the necessity of equipping all our party lines in the same manner. By using "straight-way" generators, fully two-thirds of the ringing is eliminated, only the signal from central being audible at all the stations on the line, and any one who has installed or used a party line is cognizant of the fact that the paramount difficulty and chief cause for complaint is on account of the multiplicity of rings.

"'How do we prevent eavesdropping on these lines?' was asked. We do not prevent it. When the service is installed the subscribers are warned to remain away from the instrument when they hear another subscriber's call sounded, and shown that if they desire immunity from annoyance of other patrons of the line, they must remember and put into practice the Golden Rule. After the novelty of the thing has worn off, little trouble is experienced from this source. The farmers themselves find means to reduce that kind of trouble to a minimum, and generally make it pretty warm for that class of subscribers, called in up-to-date English, 'rubbernecks,' who are afflicted with an almost unconquerable desire to

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know what their neighbors are talking about."

The paper received liberal applause and seemed to strike the sentiment of an enthusiastic meeting.

After the reading of Mr. Briggs' paper, James B. Hoge, treasurer of the United States Telephone Company, and a prominent banker of Cleveland, was introduced by Judge Thomas as one to whom much credit was due for what might be termed the second growth of independent telephony.

Mr. Hoge announced for his subject "Finances." He stated that while he had only been identified with the telephone business for the past two years, he had been in an excellent position to appreciate the great development being made, not only in Ohio, but in the surrounding States. He referred to the many new companies springing up in various parts of the State and said that while now was the time to be aggressive, the movement should be on a safe basis. Great care should be used in financing new projects and sufficient funds should be raised, either by selling stock or floating bonds, to take care of the growth for some time to come. "Many failures," said he, "have resulted from attempting to operate on too small a capital. Concerns which have enjoyed a rapid growth have attempted to provide for large improvements without securing additional capital, relying on their earnings to pay for extensions. For this reason they have been unable to pay dividends, causing their stockholders to become dissatisfied. This has had a tendency to force retrenchments, and in some cases the service has suffered.

In speaking of the defense of the Berliner patent suit, he said that great credit should be given to Messrs. Basin & Basin, the attorneys who conducted the defense; to President Thomas and Secretary Critchfield, who assisted, and also to leading manufacturers and heads of various independent companies who provided funds for conducting the defense.

Mr. Hoge stated that two weeks ago there was held at Chicago a conference of leading manufacturers and operators, for the purpose of raising funds to liquidate on an equitable basis the amounts pledged by certain prominent persons to fight the Berliner patents; also to provide a fund to cover expenses of defense in case the Berliner patent case should be carried to higher courts. He stated that it had been decided to raise $25,000 for this purpose. The manufacturers present at the Chicago meeting agreed to provide one-half that amount, the operators to provide the balance. As it had been impossible at that time to bring the matter before the Ohio Association, President Thomas and Secretary Critchfield had agreed, on their own responsibility, to pledge the Ohio Association to the amount of $4,000, this being considered an equitable portion of the total amount, in view of the numerous independent interests in Ohio.

Mr. Hoge asked the members as a matter of business to ratify the action of the State officers in making the pledge and give their checks for the amounts assessed. "If there was ever a time when the telephone business should be aggressive, it is this year," said the speaker.

Judge Thomas explained the division of the fund above referred to between the operating companies and the manufacturers in equal amounts, and said that not a cent of it would be spent outside of the purposes for which it was intended. He also said that any amount remaining after the cases were settled would be returned. There were a few objections on the ground that the manufacturers should take care of their own cases, but Judge Thomas protested against this view as manifestly unjust, since the operators as well as the manufacturers are vitally concerned in the ultimate outcome of this suit. He stated that the money would be utilized wholly for the purpose of the defense of the Berliner and Carty patent cases, and that in event of a surplus the money would be returned to the members of the association. He said that the assessment would amount only to about 7 cents per telephone in operation by the various companies, and the same amount for each mile of toll line.

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Mr. Cable suggested that there should be a committee on taxation appointed to see that there is a fair and uniform method adopted for assessing telephone companies. The State board has invited a conference with the State association or its representatives for this purpose.

Next a roll call was taken to ascertain what the members present would be able to contribute to the legal fund promised from this State, and it resulted as follows:

Name of company —	Tele-phones.	Miles toll line.
Antwerp Telephone Company	80	10
Archbold Telephone Company	90	...
Bellefontaine Telephone Company	385	40
Bellevue Home Telephone Co.	360	...
Black River, of Lorain	650	...
Bluffton	200	...
Bowling Green	343	7
Bryan	368	...
Caldwell	75	40
Canal Dover	1,500	40
Carey	124	...
Celina	185	22
Chillicothe	725	110
Citizens', of Columbus	4,988	...
Citizens', of Fayette	115	...
Citizens', of Fostoria	450	...
Citizen's, of Washington C. H.	800	50
Clinton, Wilmington	600	100
Columbiana County, of Salem	1,905	40
Covington Home	135	10
Crestline	150	...
Cuyahoga, of Cleveland	6,050	50
Delta Home	135	...
Dunkirk	54	...
Eaton	325	30
Edgerton	115	...
Franklin, Westerville	65	...
Galion	360	...
Gallipolis	350	...
Home, of Cambridge	400	60
Huron County, Chicago Junction	450	50
Inland, DeGraff	85	100
Jefferson and Warren	400	100
Kent	360	40
Kenton	400	...
Lancaster	392	...
Lawrence, of Ironton	450	...
Lima	700	...
Marysville	170	60
Massillon	605	53
Mechanicsburg	300	33
Miller's, of West Unity	150	...
Millerburg, Wooster and Orville	1,000	150
Montpelier	165	...
Morrow County, of Mount Gilead	300	100
Mount Sterling	200	50
Mount Vernon	675	110
Newark	682	200
New London and Greenwich	200	...
New Washington	50	...
Northwestern Toll Line, Defiance	...	70
Paulding Home	175	...
People's, of Shelby	325	...
Pioneer	75	...
Piqua Home	700	25
Plain City	200	100
Portsmouth	670	...
Ravenna Home	360	25
Rising Sun	42	3
Sandusky	900	25
South Charleston	120	20
Sunbury and Galena	160	...
Tathens, of Athens	180	40
Tiffin Home	825	...
Troy	...	416
United States (long distance)	250	2,000
Upper Sandusky	210	40
Urbana	825	15
Wapakoneta	130	...
Waverley	175	50
Williams County	75	168
Woodsfield	200	80
Youngstown	1,300	...

Reports made by delegates from various portions of the State indicate that since the settlement of the Berliner patent case, the Central Union Company and other Bell licensees are showing a decided willingness and even desire to compromise with independents in the matter of distribution of territory. At Celina the Bell licensee offered to withdraw his application for a local franchise if the independent company would grant him connection with five independent toll stations. At Ironton, the Bell Company agreed to keep out of the town if the independent company would allow them the use of a toll line thru town. The independent company declined to consider the proposition, and the Bell Company undertook to secure a franchise thru the town. The council, however, declined to grant a franchise because a Bell licensee had formerly had a franchise which had been revoked because of poor service.

Judge Thomas stated that the American Telephone & Telegraph Company, the Bell long-distance company, was applying for franchises in a number of towns, assumedly for long-distance lines only. He stated, however, that a careful consideration of their franchises indicated that they were also securing the right for local exchanges in certain places. In some cases they had induced village councils to pass ordinances in

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one evening without giving an opportunity for careful consideration of the true status of the franchise. He advised independent companies to insist that all Bell franchise applications should be carefully considered.

Secretary Critchfield made some stirring remarks on the subject of compromising with Bell companies. He stated that two years ago the Bell managers would hardly speak to an independent man. Now, however, reports are coming from all quarters indicating a desire to compromise. He said that this was certain indication that the independent companies had secured the upper hand and that there could be no better acknowledgment of the fact by the Bell people. His views were seconded by several prominent managers.

The question of tax valuation on independent telephone properties came up for discussion. It seems that heretofore there has been no standard method of appraising the properties of the independent companies, while under a recent decision of the courts the Bell properties have been taxed at a straight valuation of $10 per telephone. In some counties the independents have been taxed on mileage of lines, others on the capital stock, and still others on the receipts. The State Board of Arbitration was quoted as being desirous of having a uniform measure adopted, and on a motion the Chair appointed H. D. Critchfield, Cleveland; Edwin Kibler, Newark; D. J. Cable, Lima; Judge Hagarty, Columbus; Frank Davis, Columbus, and Henry Dougharty, of Columbus, as a committee to confer with the State officials on the matter.

The forenoon session adjourned, and after luncheon the members visited the plant of the Columbus Citizens' Telephone Company and inspected it. They were conducted thru the various departments by Manager Frank L. Beam.

Upon reassembling at 3 P.M., Mr. G. P. Thorpe, of Wilmington, Ohio, made a short address on the subject "Toll Lines; their Advantages as Auxiliaries to the Local Exchanges."

Mr. Thorpe explained that he had not found time to prepare a paper, but he made a few interesting remarks extemporaneously. He said in part: "There are two classes of toll lines. First, those that pay, and, second, those that do not pay. The question of how to determine whether or not a toll line will pay, is a great problem for which no rule can be devised. As auxiliaries to local business, toll lines are unquestionably of great importance. A toll line does not mean simply a line which connects two villages. Such a line alone seldom pays. But it is the farmers who live near enough to connect with such a line that make it profitable. One subscriber in the country very often makes three new ones in the village or town. The farmer has numerous friends in the village with whom he is desirous of communicating, and in that way the local exchange is built up. In deciding whether it will be profitable to run a toll line out from the town, one must study all the conditions of the country people. One must learn their social, business and even political relations. Country lines should be built of good material, and at the same time they must be cheap to be profitable. However, the cheapest is seldom the best investment in the long run. A great many companies make the mistake of not securing the right of way before commencing to build. It is an inherent sentiment with every American, especially every American farmer, that he does not want to feel that he is being imposed upon. In nine cases out of ten if you go about it in the correct way, the right of way is granted without trouble. The farmer likes to feel that you are under obligation to him. But if you undertake to build a line over his property without permission, he will find all kinds of damage. Speaking of the present competition in his town, Mr. Briggs stated that his company had 825 subscribers, 210 of them being business houses, while the Bell Company has 500 subscribers, only 50 of them being business houses. The Bell rates are 50 cents and $1 per month, and in some cases telephones have not been paid for in months. The rates of the independent company are double those of the Bell. His company made it a point to build toll lines wherever there is a demand for them. Sometimes it is nec-

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essary to go to poor towns, and in a number of cases the lines are not a paying investment at present, but the company believes in covering the entire field and in keeping out the opposition at all costs. In the long run this proves a paying investment, since it is easier to secure local subscribers when it is shown that the entire community is thoroly covered.

Judge Edward Kibler, of Newark, manager of the oldest independent company in the State, held a similar view. This company's toll lines reach every postoffice in Licking county — thirty-two in all. Some of the stations earn only $1.50 per month, while others take in from $16 to $20. On the whole, the toll lines are an excellent investment. Its rates are twenty-five miles for 10 cents. The Newark company has twice as many subscribers as the Central Union Company at that point, despite the fact that the Central Union Company gives 50-cent rates and in some instances, free telephones. Mr. Kibler mentioned the case of an old lady who applied to the town authorities for assistance. An investigator called on her and found her to be in very straitened circumstances. He said he would go to a neighboring drug store and telephone for some food and coal, when the old lady remarked: "No need of going to a drug store; I have a telephone in the next room." "Perhaps it is not necessary to tell you what kind it was," said Mr. Kibler.

Mr. Henry Hildebrand, of Washington Court House, stated that his company has 424 telephones in the county. Free service is given to the county seat for ingoing messages, but charges are made for outgoing messages. Charges are also made for messages passing thru the central exchange. The toll lines of this company net about $2,000 per year after paying charges to the United States Company on long-distance messages.

After the discussions were closed, the election of officers was next taken up, and in less than one minute Judge J. M. Thomas and H. D. Critchfield were re-elected president and secretary-treasurer, respectively, by acclamation. J. B. Cable, of Lima, was elected first vice-president, and C. Y. McVey, of Youngstown, second vice-president.

The meeting was the best attended and most enthusiastic of any of the State associations that have been held hitherto, and indicates the permanency of success attained by the independents in Ohio.

THE NEW COMMISSIONER OF PATENTS.

Frederick I. Allen, who was appointed by the President as Commissioner of Patents, was born in Auburn, New York, January 19, 1859.

The new commissioner is a graduate of Yale University, where he took a high stand in the Sheffield Scientific School. He was admitted to the bar of New York State in 1882. Since then he has been in the active practice of his profession, making patent law a specialty and having a practical monopoly of that class of law business in this vicinity. He has met with remarkable success in nearly all of his litigated cases.

Mr. Allen is a great reader and is regarded here as one of the best informed men in this part of the country on scientific and technical subjects. The indorsements which he secured from the judges of the United States Courts, from the Judges of the Supreme Court of this State and, without exception, from the members of the bar, were of the highest character. Notwithstanding all this local recommendation, S. P. Sheerin, secretary of the Independent Telephone Association of the United States and the largest holder of independent telephone properties in Indiana, states that the Independent people the country over protest against the appointment of Mr. Allen as Commissioner of Patents.

The independent telephone interests, Mr. Sheerin says, now represent $75,000,000 of capital and the interest and investment are growing rapidly. Mr. Allen is understood by the Independents to be a pronounced Bell Telephone man, and to be by temperament and antecedents unfitted for this position, which is in a sense, they say, a judicial one.

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WANTED,

WANT ADS.

Which will appear on this page under the heading "WANTS." They will be classified under the following heads:

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Vol. XV. January-June, 1900,

OF THE

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Telephone Magazine

VOL. XVII. CHICAGO, JUNE, 1901. NO. 117.

THE FIFTH ANNUAL CONVENTION

OF THE

INDEPENDENT TELEPHONE ASSOCIATION

OF THE UNITED STATES OF AMERICA,

BUFFALO, N. Y., JUNE 11, 12 and 13, 1901

The Fifth Annual Convention of the Independent Telephone Association of the United States of America will be held June 11, 12 and 13, 1901, at Buffalo. The headquarters of the Association will be at the Iroquois Hotel and the convention will be held in the banquet room of the Convention Hall, Virginia street and Elmwood avenue.

Following is the program:

Tuesday, A.M.— Reception of delegates, distribution of badges, tickets, etc., at headquarters, Iroquois Hotel.

Tuesday, noon.— Opening of the convention in the banquet room of the City Convention Hall, corner Virginia street and Elmwood avenue. Address of Welcome. Response by president, James M. Thomas. Annual address by the president.

Tuesday, P.M.— Inspection of exhibits made by manufacturers in connection with headquarters at the Iroquois Hotel.

Wednesday, 10 A.M.— Second session of the convention at Convention Hall. Paper by Hon. S. P. Sheerin, Indianapolis, Indiana. Subject: "Village Exchanges, Farmers' Lines, Rates and other lessons." Discussion by J. B. Ware, of Detroit, Michigan, and T. J. Fricker, Ashtabula, Ohio. Paper by Charles E. Wilson, Philadelphia, Pennsylvania. Subject: "Independent Telephone Development East of the Alleghenies." Discussion by C. E. Stinson, of Rochester, New York, and Senator C. W. Kline, of Hazleton, Pennsylvania. Reports from various States and other business.

Wednesday, P.M.— Inspection of exhibits by manufacturers in connection with headquarters at the Iroquois Hotel. Pan-American Exposition and Niagara Falls.

Thursday, 10 A.M.—Third session of the convention at Convention Hall. Reading of paper by H. D. Critchfield, of Cleveland, Ohio. Subject: "Legislation and Litigation." Discussion by Ed Kibler, of Newark, Ohio, and C. S. Bash, of Fort Wayne, Indiana. Reading of paper by E. B. Fisher, of Grand Rapids, Michigan. Subject: "Bell Methods." Discussion by George W. Boers, of Fort Wayne, Indiana, and W. A. Bisbee, of Savannah, Georgia. Election of officers and unfinished business.

The officers of the Association are: James M. Thomas, president, Cleveland, Ohio; H. C. Young, first vice-president, Columbia, Pa.; C. E. Stinson, second vice-president, Rochester, N. Y.; H. E. Teachout, third vice-president, Des Moines, Iowa; S. P. Sheerin, secretary and treasurer, Indianapolis, Ind.; R. F. Johnson, first assistant secretary, Saginaw, Mich.; Sam E. Wayland, second assistant secretary, Wilkesbarre.

Everybody will be made welcome.

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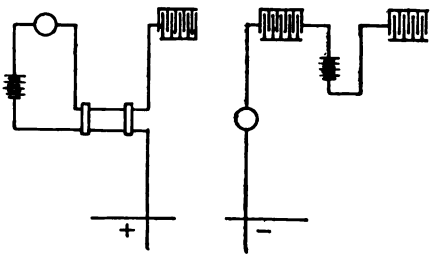
WIRELESSNESS.

BY EDWARD J. WAKEMAN.

(Continued.)

This is the first great "wireless" suit, and diagrams showing the difference between the Dolbear and Marconi systems will be of interest. We illustrate them herewith:



DOLBEAR'S PATENT.

Professor Dolbear, in his patent specifications, claims to "establish an electric communication between two or more places without the use of wire or other conducting medium, and consists of connecting the transmitting instrument with a ground, the potential of which is considerably above the normal, and the receiving instrument with a ground, the potential of which is considerably below the normal, the result being that an impulse from the transmitter is sufficient to cause the receiver to give intelligible signals transmitted thru the earth without need of any circuit such as has heretofore been deemed necessary."

MARCONI'S PATENT.

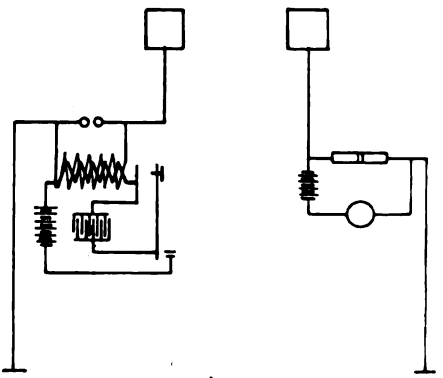
The specifications in the Marconi claim are brief: "According to this invention electrical signals, actions or manifestations are transmitted thru the air, earth or water, by means of oscillations of high frequency, such as have been called the 'Hertz rays,' or 'Hertz oscillations.' Usually all line wires are dispensed with."

With the exception of the transmitting keys, sounders and batteries employed in both systems, as they are in all wire systems, there is not a single point in common.

Dolbear uses a coil of simple construction and connected therewith is a key and a battery. One terminal of the "cut convolution" is attached to a condenser and the other end leads to the ground. This is his transmitter.

Marconi employs a Ruhmkorff coil with an interrupter, condenser and oscillator. It is absolutely distinct from the coil of Dolbear. The spark-gap is the unique feature of the etheric wave transmitter.

A receiver connected to the earth by one of its terminals and to a condenser, which in turn leads to a battery and another condenser, completes the receiving device. The battery here and the last condenser is of no value whatsoever. The Marconi receiver bears no resemblance to the one just described. its essentials being a coherer in series with a battery and relay. There is no similarity between the two methods or



MARCONI'S PATENT.

the appliances for effecting the transmissions.

It is evident that neither Dolbear nor Marconi could have obtained claims broad enough at this late date to cover the art of transmitting signals without wires, since this has been performed for the last hundred years. Accordingly, one inventor has an equal privilege with another to send "wireless" signals, assuming, of course, that he does not infringe his brother inventor's methods or apparatus. In the recent suit between these pioneers of space telegraphy, there was no question raised involving the right of the defendant to send signals without wires by electricity, but it was the *method* by which these transmissions were effected and the infringement of device. The Dol-

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bear claim, where the earth or "ground, the potential of which is raised considerably above the normal and the receiving instrument with a ground, the potential of which is considerably below the normal," sounds very much like an extract from a paper read by Silvá, the Spanish physicist, on December 16, 1795, before the Academy of Sciences in Barcelona. The excerpt referred to was thus written over one hundred years ago:

"One could arrange at Mallorca an area of earth charged with electricity and at Alicante a similar space charged with the opposite electricity with a wire going to and dipping into the sea. On leading another from the seashore to the electrified spot at Mallorca, the communication between the two charged surfaces would be complete, for the electric fluid would traverse the sea, which is an excellent conductor and indicate by the spark the desired signal."

It would seem that the Dolbear patent claims and Signor Silvá's method are as nearly identical as they could possibly be, considering that a century elapsed between the written descriptions. From this curious coincidence one may infer why the Dolbear patent required four years before it was finally issued, although there were probably some other reasons equally as vital.

The method employed by Marconi is of comparatively recent date. Hertz, the German scientist, as every one knows, had by his brilliant deductions made, more than any other man, the Marconi method possible. His etheric wave theory is well known, but the fact that a wire is necessary from the transmitter to the earth and from the earth leading to the receiver, made the Marconi method the equivalent of the Dolbear, in the opinion of the owners of the latter's pattern.

A. Frederick Collins in the *Electrical World and Engineer* states:

The absolute connection existing between the etheric waves and the electric action obtained thru the earth is not clearly understood, but I consider that it is an electrostatic displacement primarily; when the instruments are employed for short distances, the spark-gap and coherer need not be grounded with a wire, but that the high-potential, high-frequency waves find their way between the transmitter and receiver thru the apparatus, tables, floors and buildings, and thru the ground, thus completing its course, is absolutely certain.

As to the art of Hertzian wave telegraphy, its evolution was so marked — tho the time of its development was rapid — that it belongs to the world and not to any one man. Hertz, Calzecci, Branly and Lodge constructed etheric wave apparatus, but failed to grasp its possibilities. Marconi followed with a practical working device in 1895.

It would seem, then, that the methods of space telegraphy employed by Marconi and Dolbear are signally different; in truth, they are, and so the Court decided. Since neither could establish a precedent in the art of space telegraphy and their methods of propagation are different, there remain but two points to be yet considered — that of commercial value and infringement of apparatus.

Both the defendant and the plaintiff claimed the system of the opposing side to be useless commercially. The testimony proves that Marconi has transmitted signals nearly two hundred miles, and it is a question if Professor Dolbear transmitted signals the stated half mile. He certainly could not have with apparatus constructed according to his patent specifications. One of Mr. Marconi's experts, Dr. Fleming, of London, in his deposition stated that he had constructed instruments according to Dolbear's patent instructions and failed to obtain any results, as the specifications claimed. This is hardly the fault of either Dr. Fleming or Professor Dolbear. In the diagram shown the condensers illustrated are the ordinary dielectric type, but of condensers there are several types, as the Leyden jar, the human body and the earth itself. Had Dr. Fleming utilized his own body instead of the condenser shown in the patent drawing, his efforts would have been crowned with success. When the Dolbear system is operative it is not in accordance with the theory stated in his claims.

Thus ends the first great wireless suit.

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In the future there can never be the gigantic legal battles like those fought by the "line wire" companies in the past, since no deep, basic claims can be obtained covering the art in the broad sense. In the case just closed — to my way of thinking, and, I believe, to all whose sense of justice lead them to desire that the right may win — the decision of the Court was entirely satisfactory.

Over in France they seem to think the biggest thing yet accomplished in wireless telegraphy is the establishment of communication between France and Corsica by its means a few days ago. The Marconi system was the one employed, and the company's officials, with the permission of the French Government, erected the necessary apparatus; the two poles, one of which was planted on the mainland of Brague, near Antibes, and on the island, standing at 130 feet high. The distance between the communicating stations is 125 miles, and the messages were exchanged with perfect clearness. This is exceedingly satisfactory, and it begins to look as if other governments will take advantage of the advance made in this science.

The Cunard liners will be equipped as rapidly as it can be accomplished.

In our country, on May 8, the board of naval officers, headed by Captain Chadwick, appointed to make a full investigation and report of wireless telegraphy, completed its work and submitted its report to Admiral Bradford, chief of the naval bureau of equipment, having charge of this subject. It had been expected that the inquiry would last thru the summer, and the Navy Department has been somewhat surprised at the promptness with which the board has been able to reach its conclusions. Altho the findings are not made public, it is known that the board reports on the entire feasibility of the system and recommends that it be adopted and that the present system of using carrier pigeons for messages between naval points be abandoned.

With the report the board submits the results of an extended conference with Signor Marconi, the Italian inventor, concerning the general subject of wireless telegraphy. It is understood that Marconi made no proposition regarding his own system, and that the board secured his views as an expert on the general subject. There is no finding in favor of any particular system, but a general treatment of all systems. The board has no doubt that wireless telegraphy will prove a valuable adjunct for the navy.

DIVORCE BY TELEPHONE.

Mrs. Nagle, of Arcadia, Indiana, was granted a divorce by telephone. The case probably is without a parallel in the history of an Indiana court. James M. Fippen, of Tipton, attorney for Mrs. Nagle, recently brought suit in the Hamilton circuit court for divorce. The case was called for trial. Attorney Fippen was already busy with another case and could not be present in court.

It was finally arranged to try the case by telephone. The witnesses were assembled in the telephone exchanges at Tipton and Noblesville, and gave their testimony by wire. Fippen then delivered his argument by telephone to Judge Neal.

"The divorce is granted," promptly responded Judge Neal when his appeal ended.

FOR A NICKEL TOLL.

The Pittsburg & Allegheny Telephone Company is this week installing an automatic telephone toll service that promises to be popular, on account of its low prices, 5 cents for a three-minute message to any part of the two cities. Telephone service from toll stations in Pittsburg has never before been less than 10 cents, and a great number of the new automatic 'phones are to be installed in different parts of Pittsburg and Allegheny.

With the new system one will be able, by dropping a nickel in the slot, to talk to any point on the Pittsburg & Allegheny lines. The officials of the company hope, thru this system, to boom their lines. A list of additional subscribers, issued by the company, recently, showed 1,600 new instruments added in less than three months, making a total of 4,800 in the two cities.

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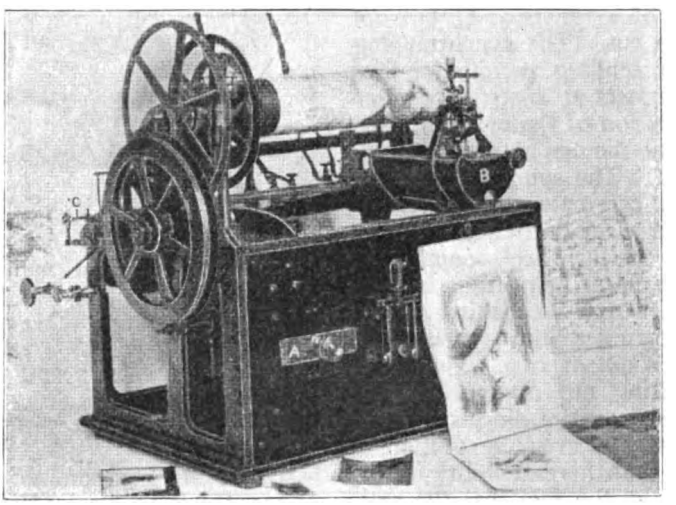
THE FACSIMILE TELEGRAPH.

The most recent development of the facsimile telegraph machine for newspaper work is that designed by Mr. H. R. Palmer, M. E., and Mr. T. Mills. This apparatus is now being brought to public notice and is attracting the attention of some of the most prominent daily newspapers. It has been practically tested between Cleveland and St. Louis on the wires of the Associated Press, with, we are informed, satisfactory results. The machine will be exhibited in practical operation at the Pan-American Exposition this year. It is



FACSIMILE TELEGRAPH MACHINE.

controlled by the International Electrograph Company, of Cleveland, Ohio, of which Mr. Palmer is president.

The above cut shows one of the machines and represents either the transmitter or the receiver, since one is an exact counterpart of the other, with the single exception that in the transmission a stylus replaces the pen in the receiver. Both of these parts, however, are interchangeable, so that one machine may be used as a transmitter or a receiver.

This machine is said to be the only one ever developed which will transmit half-tone pictures. In accomplishing this result the original photograph or sketch is up to a certain point treated practically in the same manner as a regular half-tone engraving for printing purposes.

In the final preparation the zinc plate for the transmitting machine, the small spaces or depressions on the surface, due to the etching bath, are filled with an insulating substance, to give a smooth surface for the stylus to pass over. The plate is then bent to the curve of the cylinder of the transmitter and locked in place. The entire time required in the preparation of the plate is about twenty-five minutes. In transmitting the cylinder revolves, and the stylus, which is actuated by means of screws of 40 or 80 threads to the inch, as desired, moves in a direction parallel to the axis of the cylinder. As the plate passes under the stylus the circuit is made and broken by the succession of insulated and uninsulated surfaces of the plate. The impulses thus sent over the line are recorded on the receiving cylinder by a pen which is operated in the same manner as the stylus. It is evident from the relative motions of the cylinders and stylus and pen that in effect the transmission and reproduction of the picture are in the form of a spiral line of small pitch. This line is broken up in a manner corresponding with the lights and shades of the original, and as both machines work in synchronism, the re-

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corded marks must necessarily correspond with the metal surfaces on the transmitting cylinder which caused them to be made, thus the pictures are built up by parallel lines. Eighty-seven impulses per second are imparted to the pen, which records a dot for each impulse.

The machines are operated by 110-volt motors, each of ⅛ horse-power, running at 3400 r. p. m. By means of gears the speed of the cylinder is reduced to 40 r. p. m. The receiving pen is actuated by an electromagnet, consisting of W. U. standard 150-ohm coils, at B (Fig. 1), the synchronizing device being similarly controlled by another pair of magnets at C, but not visible in the cut. The synchronizing is effected by sending an impulse thru the latter magnets at a certain portion of each revolution of the cylinder, during which time the pen magnets are cut out of circuit. The synchronizing impulse, which originates at the transmitter, causes a small friction brake to be applied to the fly-wheel, some of the motion of the latter being thus imparted to a secondary mechanism which brings the cylinder into synchronism in case it gets out of step. The possibility of getting out of synchronism, however, is very remote, since synchronism takes place at every revolution of the cylinder, and this possibility is further reduced by the fact that the ratio of the speed of the cylinder to that of the motor is so large that it would require considerable variation in the speed of the motor to make any perceptible change in the speed of the cylinder in one revolution. In practice, however, it has been found rather an advantage not to have the machines in exact synchronism. When they exactly correspond there is a tendency to see-saw, which is obviated by retarding one of the machines slightly so as to insure both starting each revolution at the same instant, irrespective of their relative motions at the end of the revolution. By turning the switch A to a vertical position, and substituting a stylus for the pen, the machine may be used as a transmitter.

The inventor of this machine does not make any claim for any new principles, but rather to improvements which enable him to reproduce half-tone pictures and to reproduce pictures at a much greater speed than has heretofore been possible — both considerations of prime importance to the modern daily newspaper.

PORTRAIT OF MARCONI, RECEIVED ON A FACSIMILE TELEGRAPH MACHINE.

WASHINGTON, D. C. TELEPHONE COMPANY BILL KILLED.

In the Senate a final effort was made to pass the Washington Telephone Company bill, in which H. A. Parr, George Webb and many other Baltimoreans are interested. The bill was read, but Senator Wellington opposed its passage. He raised the question of consideration against it, and on a vote the Senate, by a vote of 28 to 26, refused to consider it. So the bill was laid over, which killed it for this session. The company must, accordingly, at the beginning of the next Congress, begin its work over again.

BARE WIRE RUN ON SNOW.

To maintain telephone connection between the Mount Ætna Observatory and the town of Nicolosi, bare wires are laid on the frozen snow with successful results.

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THE ACOUSTIC AND ELECTRIC CONSTANTS OF THE TELEPHONE.

BY MAX WIEN.

Translated from *Annalen der Physik.*

The fundamental basis of distinctness in the transmission of speech thru the telephone is that the relative amplitudes of the different notes constituting speech should remain the same, all the notes being reduced in the same proportion. It is not intended herein to discuss the influence of the wire and microphone receiver, but to examine whether in the telephone itself, considered as an electromagnetic apparatus on the one hand, and as an acoustic apparatus on the other, there are causes for the different transmission of varying tones.

The tone of the telephone is due to the motion of the diaphragm. The force moving the diaphragm is the magnetic induction in the iron core of the telephone coil, and the variations of magnetic induction are produced by the alternating current in the coil. The following questions, therefore, come up: In what way does the current intensity at constant E. M. F., the magnetic induction at constant current, the amplitude of the diaphragm at constant magnetic induction, change for the various frequencies. The current intensity depends in a known manner upon the resistance and the inductance, but the matter is complicated by the fact that the effective resistance and the effective inductance of the telephone depends to a very great extent upon the frequency, since owing to the Foucault currents in the iron core of the telephone coil the resistance must rise with the frequency and the inductance must fall. It is also evident that the magnetic induction falls with increasing frequency, since the Foucault currents exert a retarding action upon the central portion of the iron core. Finally, the amplitude of the telephone diaphragm must show a series of maxima for its proper notes if the moving force remains the same.

The notes contained in the human voice range from the lowest audible notes of 16 vibrations per second, up to 10,000 and more in the characteristic components of many vowels and in the consonants. Between those limits the acoustic and electric quantities are to be determined by the following telephones: (1) a Bell telephone; (2) an older telephone by Siemens and Halske (No. 13,306); (3) a newer telephone by Siemens and Halske (No. 353,968); (4) a box telephone made by Apel, of Göttingen, as used in Nernst's method of determining dielectric constants. The distinctness of speech was about the same in all the four telephones. The vowels were clearly rendered, and similar words like "Pfirsich" and "Vierzig" were always distinguished with absolute certainty. The older Siemens telephone rendered the hissing sounds only softly. The timbre was nasal in the Apel telephone. The currents used were produced by the alternate current, which is capable of furnishing nearly pure sine currents up to frequencies of 17,000. The currents of frequencies 64 and 128 were produced by a sine inductor. The effective inductance and the effective resistance were determined by Maxwell's bridge method. The sine current sent thru the bridge system was made so weak that the magnetic induction in the telephone electromagnet did not go beyond the first linear portion, so that the inductance was independent of the current strength. This was determined in such a manner that on doubling the current the bridge readings did not change. As a bridge instrument I used the Bellati-Giltay dynamometer. The results of the measurements of the various telephones were the following, where N denotes the frequency per second, N = 0 a constant current, W′ the effective resistance in ohms, and L′ the effective inductance in centimeters:

(See Table I.)

We see that the effective resistance, in accordance with the greater loss of energy thru eddy currents, rapidly rises with increasing frequencies, and even attains the 13-fold value of the original resistance in the newer Siemens telephone. The effective inductance, on the other hand, decreases, most of all in the old Siemens telephone, when it falls to about one-fifth of its value for 256. The inductance is little influenced by eddy currents at N = 256, as shown by com-

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parative measurements with N = 128. The difference between the values for N = 8,000 and N = 16,000 is comparatively slight; it is really only the outermost layers of the iron which take part in the magnetization at this stage, and the number of lines of force is not much larger than it would be if no iron were present. Assuming, with Helmholtz, here we have two opposing influences. Whether they just compensate each other at a certain point, or whether the higher notes are strengthened or enfeebled, depends upon external conditions, such as the resistance and capacity of the line, etc. In any case, this change of the electromagnetic constants with the frequency plays a

TABLE I.

EFFECTIVE RESISTANCE AND INDUCTANCE OF THE TELEPHONES FOR VARIOUS FREQUENCIES.

—	Bell.		Siemens I.		Siemens II.		Apel.	
N	W′	L′	W′	L′	W′	L′	W′	L′
0	6.67	.....	186 6	.....	199 7	.....	96.2	.....
256	6.90	3.53×10^6	238 6	1.17×10^8	286.5	1.93×10^8	108.7	3.73×10^7
1,000	9.52	3.28×10^6	422.6	7.45×10^7	586.2	1.23×10^8	159.0	3.08×10^7
4,000	21.7	2.75×10^6	963.0	3.97×10^7	1,494.0	8.87×10^7	329.7	2.50×10^7
8,000	33.2	2.42×10^6	1,275.0	2.94×10^7	2,100 0	6.8×10^7	482.0	1.96×10^7
16,000	37 5	2.16×10^6	1,457.0	2.30×10^7	2,590.0	5.8×10^7	609.0	$1\ 63\times10^7$

that the E. M. F. in the telephone circuit increases in proportion to the frequency, the current is proportional to $n\sqrt{W'^2+n^2L'^2}$, where $n = 2\pi N$ means the frequency per 2π seconds. If L′ is large in comparison with W′, the expression is sensibly independent of n, assuming that W′ and L′ do not vary with the frequency. But as we have just seen, they do to a great extent, W′ rising with the frequency, while L′ falls. The latter change is of great influence at the higher frequencies, so that, for instance, for the telephone Siemens I. the expression

$$\frac{n}{\sqrt{W'^2+n^2L'^2}}$$

is 3.4 times as large for N = 16,000 as it is for N = 256, and hence the loudness of the corresponding note would be $(3.4)^2 = 11.5$ times as great. On the other side, the magnetic induction falls with increasing frequency in proportion to L′, and reduces the amplitude of the diaphragm and the intensity of the higher notes. In the telephone Siemens II., the intensity of the note N = 16,000, will for this reason be more than 25 times smaller than that of the note 250, for the same intensity of the alternating currents. It is evident that prominent part in the transfer of speech, and it is not permissible to base all calculations simply upon the resistance to a constant current.

Of still wider influence are the purely acoustic properties of the telephone. If the diaphragm had only a single proper note p, its amplitude, when driven by a sinusoidal current of frequency n in 2π seconds would be inversely proportional to $\sqrt{(n^2-p^2)^2+n^2k^2}$, and would thus show for $p = n$ a more or less pronounced maximum according to the degree of damping k. The latter depends upon the diaphragm itself, the way of fixing it, and the strength of the telephone magnet. Of the four telephones examined the Bell telephone has the least and the Apel telephone the greatest damping. If, by means of an alternate-current siren, a sinusoidal current is sent thru the telephone, and its frequency is gradually changed, the proper tones of the diaphragm are marked by an increased intensity. Accordingly, as they are more or less marked, and according to the damping, they produce a sharp shriek or a slow increase and decrease of the note. The lower proper notes are easier to pick out than the higher ones. The maxima, as a rule, cover a pretty large range of

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pitch, amounting to several hundred oscillations in the higher notes. The pitches of the proper notes are noted in the following table:

Bell	1,100	2,800	6,500
Apell	1,060	2,500	5,600
Siemens I	720	2,100	5,000
Siemens II	750	2,350	5,400

In all these telephones there are some feebler notes in the higher pitches, especially in the Apel telephone.

It is evident that in the Siemens telephones all the proper notes are somewhat lower than in the two others. It is a striking circumstance that in several instances there is in the higher proper notes, instead of one decided maximum, a series of two or three maxima of pretty equal strength close together. This is especially noticeable in the two notes 5,000 and 5,400 of the two Siemens telephones.

Another method of investigating the position of the proper notes and their influence upon the intensity of the notes reproduced by the telephone consists in measuring the feeblest currents which produce a just audible note in the telephone. Such investigations have already been carried out previously and some very small currents indeed have been thus found. The differences in the results obtained might be chiefly due to the fact that usually, instead of a simple sinusoidal current, the alternate current of an induction coil with pointed break currents was used. These pointed current impulses are heard in the telephone even when the mean intensity of the whole current is very small. An analogy to this might be found in the records produced on a phonograph cylinder, which is placed at such a distance from the recording stile that only the largest excursions of the latter produce a record.

Lord Raleigh has worked with a sine inductor, and for higher frequencies with the approximately sinusoidal currents produced by magnetized tuning forks in coils mounted between their prongs. Even with the latter he only attained frequencies of about 768, and the observations were rendered difficult by the very short duration of the vibration. His results for a telephone of 70 ohms resistance were the following:

N...	128	192	256	307	320	384	512	640	768
C...	2,800	250	83	49	32	15	7	4.4	10

C being the current in 10^{-8} amperes, and N the pitch. These figures agree well with those given below. To determine the sensitiveness of the four telephones for various pitches, the current of the alternate-current siren was conducted into a distant undisturbed room, and by shunting the limit of hearing was found for the note and telephone in question. The results are given in the following table. They were referred to my right ear, and give the current strength in 10^{-8} amperes, which produced a current I could just perceive with certainty at break and make.

The Bell telephone has all along a smaller sensitiveness than the other three instruments, in accordance with its smaller resistance (see Table I.).

TABLE III.

SENSITIVENESS OF DIFFERENT TELEPHONES.

N	Bell.	Apel.	Siemens I.	Siemens II.
	Amperes.			
64	$190{,}000 \times 10^{-8}$	$5{,}000 \times 10^{-8}$	$1{,}800 \times 10^{-8}$	$1{,}200 \times 10^{-8}$
128	15,000	500	220	150
256	1,050	40	26	13.5
512	150	10	1.7	2.7
720	.....	.....	*1.5*	*0.8*
1,024	*18*	3.5	3.0	1.35
1,500	30	*2.3*	6 0	2.4
2,030	130	3.5	*0.8*	3.0
2,400	.....	0.5	2.0	*1.0*
2,800	*70*	.....	.....	.....
4,000	230	70	50	30
8,000	2,500	170	700	400
16,000	12,000	1,000	2,200	1,700

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All the four telephones show a specially high sensitiveness for the currents between the pitches 500 and 3,000; both downward and upward the sensitiveness decreases rapidly, so that, for instance, in a Bell telephone for N = 64 a nearly 10,000-fold current intensity, or a more than 100 million-fold current energy is required to produce an audible note than for N = 1,024. This steep fall in the sensitiveness for high and low pitches can not be explained solely by the acoustic properties of the telephone or the proper notes of the diaphragm; it is most largely due to the variations in the sensitiveness of the human ear. I hope to deal in another paper with the conclusions to be drawn from this. The numbers given in italics in Table III., which denote the maxima of sensitiveness, agree in general with the proper notes, as determined above. This is shown most clearly in the Bell telephone, which also possesses the least damping. In the two Siemens telephones also the proper notes are distinguished by particularly small current intensities, but in the strongly damped Apel telephone the maximum of sensitiveness (N = 1,500) lies between two proper notes (1,060 and 2,500).

The most important and characteristic notes of the human voice fall between the pitches 500 and 3,000, where all the four telephones show the greatest sensitiveness. This circumstance probably conduces greatly to the distinctness of transmission. On the other hand, the differences in sensitiveness for comparatively small differences of pitch are very great just within this range, since the most important proper notes of the diaphragm fall within it. The relative intensity of the higher notes must, therefore, be very different, in accordance with the telephone used. Thus, for instance, in the Bell telephone the ratio of the sensitiveness for N = 256 to that for N = 4,000 is as 230:1,050 — no decided proper notes intervening — whereas the same ratio for the Siemens II. telephone is 30:13.5. If, therefore, the note 256 has the same intensity in both cases, the Siemens telephone must render the note N = 4,000 some one hundred times as loudly as the Bell telephone. With full and loud speaking into the microphone the proper notes are known to be often unpleasantly prominent. But in general an intelligent communication is possible by every telephone and every kind of voice. This can only be explained by the astonishing sensibility of the human ear for the characteristic marks of the vowels and consonants, which are not even obliterated by the great changes in the timber bound to take place, as we have seen, in consequence of the acoustic and electromagnetic properties of the telephone.

MANOMETRIC STUDY OF THE TELEPHONE.

L. W. Austin, writing for the February number of the London *Physical Review,* gives a description of his method of photographically registering the variations of manometric flames. He has met with considerable success in his application of the method to the study of the motion of telephone membranes.

A jet was inserted thru a rubber cork cemented into the opening of a telephone cap, and another hole was drilled in the cap thru which the gas was introduced, thus making a manometric capsule of the telephone itself. The apparatus was tried with a number of different alternators, and the curves from all of these showed their own peculiarities of form, tho a certain distortion seemed to be present. The reason for this has not been with certainty determined, but it seems probable that it is due at least in part to the flame itself and its tendency to flare. In any case, the lower line of the luminous part of the flame follows quite accurately the motion of the diaphragm, and the device is very useful for showing the current curve of an alternator. In connection with a second manometric flame actuated by a tuning fork of known period, it becomes a frequency teller. It may also be employed for studying the distortion of sounds inherent in telephone transmission, and it offers a convenient method of comparing small alternating E. M. F.'s. For photographing the flames acetylene gas must be employed.

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TELEPHONE LINE CONSTRUCTION.

BY A BELL ENGINEER.

Telephone lines can be most advantageously divided into three classes, based upon the nature of their construction. Each of these classes possess certain characteristics which are necessary and fundamental. When so classified they are (A) Overhead or Aërial, (B) Underground or Subway, and (C) Submarine. Overhead or aërial lines, as their name indicates, are those that are carried thru the air, being supported on poles, housetops, or aërial structures, such as elevated railways or bridges. Underground or subway lines are those that are laid in the earth, and are usually encased in ducts made of some substantial and insulating material. Submarine lines are those run under water.

Telephone lines may be classified in another manner. They may be either (A) Open wire lines, or (B) Cable lines. The former are those in which each conductor is separated from its fellows by considerable air space, and is run and supported independently of its neighbors. In the case of cable lines. however, the conductors are bunched together in the form of a cable, and each one is surrounded by a covering of some approved insulating material. These cables are made in various ways to suit various conditions. The nature of their construction will be dealt with later. Overhead lines may be either of the open wire, or cable types; subway or underground lines, and submarine lines are always of the cable type. Each of these classes of lines has its advantages and disadvantages. Referring to our first classification it may be said that aërial lines are the cheapest to construct and the most accessible for inspection and repairs. Subway lines, on the other hand, are more costly of construction, but are less liable to injury, and are proof against the action of storms. It is obvious that submarine lines have no substitute. Contrasting open wire lines with those in cable form, it may be said that, in the case of the former each conductor can be inspected thruout its entire length, which is very important in locating trouble; and defective conductors can be repaired or replaced without interfering with the others. With cable lines, however, while the conductors can be inspected only at the terminals, they are proof against injury from coming in contact with trees or other foreign objects, and they can not be thrown out of adjustment by kite tails or kite strings strung across them. In economy of space, the cable line is much more advantageous than the open-wire line. For example, an open-wire line consisting of forty conductors strung on four tenpin cross-arms would have a cross sectional area of 100 square feet, while if these same conductors were made up in a cable, it would have a diameter of about 1½ inches and a cross sectional area, therefore, of 1.77 square inches.

All of these classes of lines are used in modern telephone practice, and each has its proper sphere. The selection of the class of line is a problem for the telephone engineer to solve, and in its solution he must be governed by two things. First, the conditions to be met with; second, the requirements of the law. In running lines thru the country or in towns or small cities where no laws exist against the stringing of overhead wires, the telephone engineer has free rein, and may be governed entirely by the conditions to be met. In large cities, however, the case is different, and his choice will be restricted largely by the requirements of the laws.

Aside from the selection of the class of line to use, there is a certain standard practice covering the construction of each, which has been adopted after many years of trial and error, and which must be followed out closely in order to give the best results in point of operation, and the least cost for maintenance. In the discussion of this side of the question, it will be assumed that the reader is familiar with the general laws that govern the transmission of electrical energy over circuits, together with their effects as manifested in telephony. It will be assumed that he is familiar with Ohm's law, together with its necessary modification when applied to

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circuits carrying alternating currents; that he understands the laws of self and mutual induction, and that he is familiar with the meaning of the terms "cross-talk," "noisy lines," "heavy lines," and the like.

AERIAL LINES OF THE OPEN-WIRE TYPE.

It has been said that aërial lines are those which are run thru the air, being supported on poles, housetops, or aërial structures. As a matter of fact only about five per cent of the aërial lines in existence today are supported otherwise than on poles, so that in dealing with this subject we will first take up the subject of pole-line construction, and deal with the special cases later on. But before the subject of pole-line construction is taken up in detail, it will be necessary to consider the requirements of a telephone line for successful working. As is the case with all lines carrying a current of electricity, the ohmic resistance of the wire must be as low as possible consistent with economy of construction. It is not necessary, however, to figure out the diameter of wire needed for each case, as is done in electric light or power construction. Here the density of the current produced by the voice is so small that the fall of potential becomes negligible in comparison with self induction or capacity. As the result of years of experience coupled with considerable study three sizes of wire have been adopted for open-wire line construction, and the selection has been governed as much by features of construction as by electrical properties. The three sizes of wire adopted are No. 8 Brown & Sharp gauge, No. 12 B. & S. gauge, and No. 18 B. & S. gauge hard-drawn copper wire without any covering whatsoever. The first of these is used for long-distance lines, between city and city; the second is used for trunk lines between the various exchanges in a city. The third size is used for substation lines. The self and mutual induction must be reduced to as low a figure as possible, and the latter indeed must be entirely eliminated. In addition to these two quantities, there is the electro-static capacity. While this is always present, more or less, it is not nearly so prominent in open-wire lines as in cable lines, for reasons which will be explained later. There is one quality, however, which is of the utmost importance in its possession, and that is the insulation resistance. Whether the lines be wholly metallic, or whether the earth be used as a return circuit, any defect in the insulation would introduce a leak or bypass for the current, which would reduce the amount left for useful work. Furthermore, mechanical injury and the action of the weather tend to affect the insulation, more than any other quality, so that it is necessary to pay particular attention to the obtaining and maintaining a good insulation resistance.

CLASSIFICATION OF POLE LINES.

Open wire, or pole lines, as they are more usually called, are divided into two classes, each possessing these necessary characteristics: (A) *Trunk pole lines,* designed for the use of trunks, and (B) *Exchange pole lines,* designed for the use of the subscriber lines. The difference existing between these two classes exists more in the nature of construction, than in the difference of material used.

Fig. 1 illustrates the essential features of a pole line. Here the pole is shown at *a*. At *b* is shown a stick of

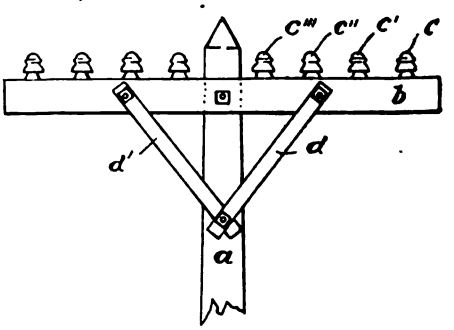

FIG. 1.

timber called a cross-arm. This cross-arm is fastened to the pole by means of two steel braces, *d d′*, called cross-arm braces. At *c c′ c″* and *c‴* are shown glass insulators to which the wires are tied. These insulators are screwed on to wooden pins which in turn are fastened to the cross-arm. It will be

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necessary for the proper understanding of the subject to discuss these essential features in detail and learn their methods of construction. The pole will be considered first.

POLES.

The poles used in telephone-line construction are divided into two classes: (A) *Standard Poles,* and (B) *Terminal Poles;* the latter, as their name indicates, being used at the points of termination. Terminal poles are made of wood or iron, and when metal is used are made in a variety of forms. Standard poles are always made of wood. In order to be suitable for use as poles, wood must possess the following qualities: A straight, even grain, free from knots, sufficient toughness to withstand the inevitable stresses, and the ability to withstand the action of the weather.

Of the various kinds of wood that possess these qualities, chestnut, Georgia pine and spruce have been selected as those best adapted for use as poles. Georgia pine is either used in its natural state, or it is artificially treated with a view of rendering it more impervious to weather. This process is called creosoting, and consists in extracting the sap, and filling the pores with dead oil of tar. The great objection to this process lies in the fact that the wood is rendered less strong. Creosoted poles are, however, used very largely as terminal poles. As to the shape of the cross section, poles are round, octagonal or square. The former being used almost universally, as octagonal or square poles are used only when a neat appearance is especially desired.

In Fig. 2 is shown a detail of a standard pole. Here the top of the pole is shown at *b,* and the bottom, or *butt,* as it is called, is shown at *c*. The top is cut in the form of a wedge, or *framed* as it is called. This is shown at *b,* and is done to throw off water. At *a a'*, etc., are shown gains cut into the pole, for the reception of the cross-arm. These gains are 4¼ inches by 4¼ inches, and ½ inch deep. The first one is cut with its center 10 inches from the top of the pole, while the distance between centers is 2 feet. The height of the pole is anywhere between 35 feet and 90 feet. Following is a table of the diameters of top and butt of the different sizes of poles ranging from 35 feet to 90 feet. In Fig. 3 is shown an octagonal pole. With this form of pole there is usually no necessity for cutting gains in this class of poles, as

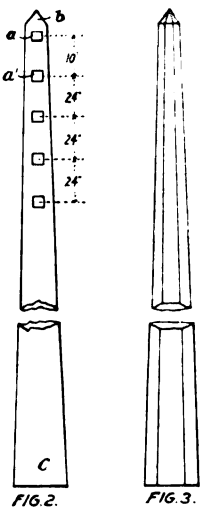

FIG. 2. FIG. 3.

the flat surfaces afford sufficient bearing for the cross-arms. The square poles are very seldom used.

Terminal poles, when of wood, are heavier timber than standard poles, otherwise their construction is the same. Except in special cases terminal poles are made of wood. When the number of wires to be distributed is exceptionally large, the terminal pole is made of special design to meet the requirements, and iron is often used.

THE CROSS-ARM.

Cross-arms, like poles, are divided into two classes, standard cross-arms and terminal cross-arms. The difference between the two is that the latter are shorter and have a smaller spacing between the pinholes. The standard cross-arm is shown in Fig. 4. At *a* will be seen the plan, and at *b* the elevation of the arm. In length the arm is 10 feet and is bored for ten 1 9-32-inch holes for the reception of pins. These holes are shown at *c c'*, etc. Five of these holes are placed on one side of

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the center of the arm, and five on the other side. The distance from the extreme outside hole to the end of the arm is 4 inches, while the spacing between the holes is 12 inches. At *a'* is shown an end view of the arm, and from this it will be seen that the top is arched to throw off water. Referring to the elevation *b* it will be seen that three holes are bored thru the side, being shown at *e e'* and *f*. The two outside ones, *e* and *e'*, are at distance of 3 feet 5¼ inches from the extremities of the arm and ⅜ inch in diameter. inches, but the thickness is the same as the standard arm. In all other respects the arm is identical with that shown in Fig. 4. Creosoted wood is used in the manufacture of cross-arms. Two other sizes of cross-arms are made; one for eight and the other for six arms. With the exception of length the dimensions are the same as those shown.

POLE FITTING.

Under this heading are included the metal parts which are used to hold the

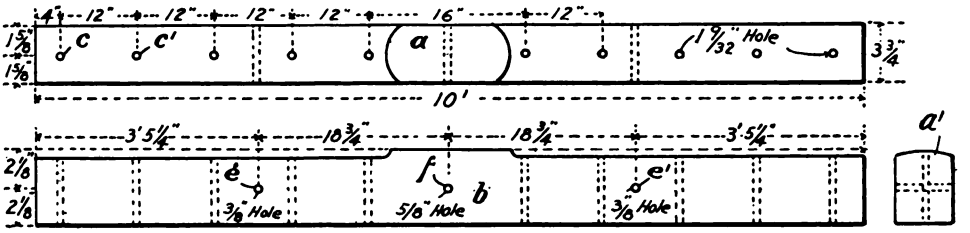

FIG. 4.

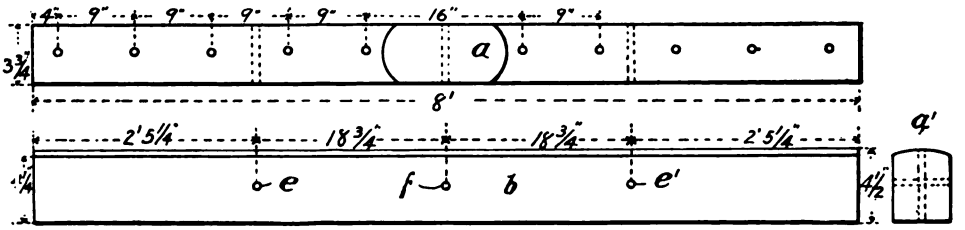

FIG. 5.

The center one *f* is ⅝ inch in diameter. The two outside holes are for the reception of the bolt for holding on the cross-arm brace, while the center one is for the reception of the cross-arm bolt. It will be observed that in the center of the arm, the top is flattened for the space of about 10 inches. This practice is resorted to in order that the water may drain off at the ends and not run down between the arm and the pole to which it is fastened. The terminal cross-arm is shown in Fig. 5; its length is 9 feet, or one foot shorter than the standard cross-arm. The spacing between pins is 9 inches, or 3 inches less than that of the standard arm. The height is 4½ inches instead of 4¼ cross-arm in place, the *pole steps,* and the material necessary for additional securing of poles. The first group consists of: *Cross-arm bolts; cross-arm braces; carriage bolts,* and *cetter drive screws.* Under the third group are included: *Guy rods; rock eye bolts; thimbles; guy clamps,* and *guy clamp bolts.*

Cross-arm bolts are used to hold the cross-arm to the pole; they are of the dimensions shown in Fig. 6. They are made of steel, galvanized and of five lengths, to suit the thickness of the pole: 10, 13, 14, 15 and 16 inches. At the end opposite the head, the bolt is threaded for a length of 5 inches, and a ⅝-inch nut is fitted over this. Ac-

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companying each bolt are two square steel washers shown at *a* and *a'* in the same figure. These washers are also galvanized.

Cross-arm braces are used to give the cross-arm rigidity, and to prevent it from revolving around the bolt.

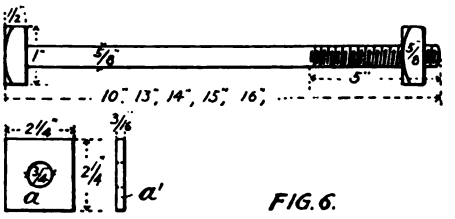

FIG. 6.

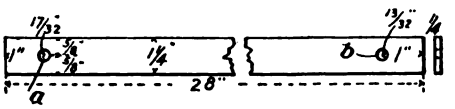

FIG. 7.

They are of the shape and dimensions shown in Fig. 7. With centers 1 inch from each end are two holes; one 17-32 inch diameter, and the other 13-32 inch in diameter. The former, marked *a* in the figure, is for the admission of the *fetter drive screw,* which fastens the brace to the pole; and the other is for use in fastening the brace to the cross-arm. These braces are made of steel, galvanized. *Carriage bolts* are used to fasten the cross-arm brace to the cross-arm, and are of the shape and dimensions shown in Fig. 8. They are made in two sizes, 4 inches and 4½ inches long. The latter size is used on terminal poles. The upper part of the shank, directly under the bolthead, is square, as shown at *a,* the rest of the bolt being round. On the opposite end a thread is cut to the length of 1¼ inches. In connection with this bolt, two round washers, shown at *b* in the same figure, are used. Both the carriage bolt and washers are made of steel, galvanized. The *fetter drive* screw, shown in Fig. 9, is used to fasten the cross-arm brace to the pole. It is provided at one end with a wood thread. This screw is also made of galvanized steel.

The standard form of pole step is shown in Fig. 10. It consists of a steel rod ⅝-inch in diameter, and 10 inches in length, one end of which is turned up, as shown at *a.* The opposite end is provided with a wood thread similar to that of the fetter drive screw. These pole steps are driven into the pole on alternate sides to afford a means of climbing the pole. They also are galvanized.

We now pass to that class of pole fittings which is of use in adding stability and rigidity to pole lines. Of this class, the first article to be mentioned is the *guy rod.* Guy rods are used to secure guy wires in a manner to be described later. They are of the shape

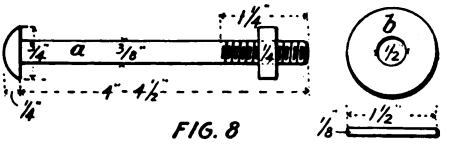

FIG. 8.

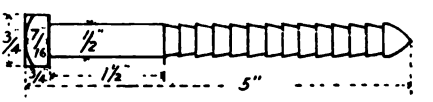

FIG. 9.

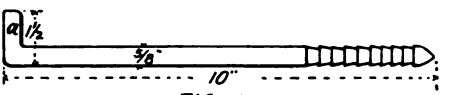

FIG. 10.

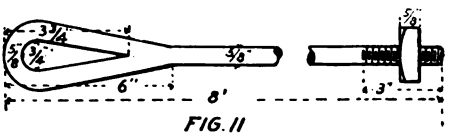

FIG. 11.

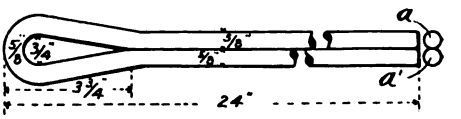

FIG. 12.

and size shown in Fig. 11. They consist of a steel rod ⅝-inch in diameter, and bent at one end into the form of an eye, with a diameter of ¾ inch. The length of the eye is 3¾ inches. At the other end of the rod, a thread is cut

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for a distance of 3 inches and over this is fitted a 5/8-inch nut. The length of the rod is 8 feet, and all parts are thoroly galvanized. A *rock* eye bolt is shown in Fig. 12. It consists of a 5/8-inch galvanized steel rod bent as shown in the figure, and having a length over all of 24 inches. The size

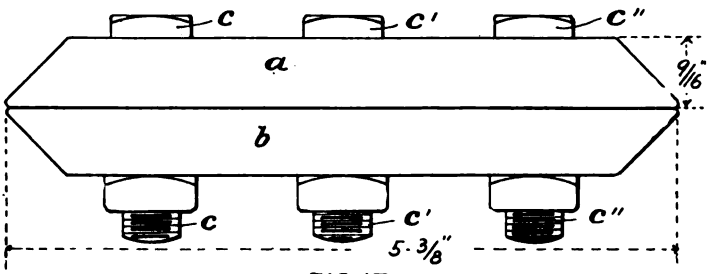

FIG. 13

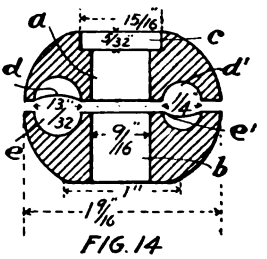

FIG. 14

of the eye is the same as that of the guy rod. The cross section is shown at *a a'*. In Figs. 13 and 14 are shown two views of a *guy clamp*. Referring to Fig. 13 it will be seen to consist of two halves, *a* and *b*, which are held together by the three bolts *c c*, *c' c'*, *c'' c''*. In Fig. 14 an end view is shown, and the two halves will be seen at *a* and *b*. The upper half *a* has a channel *c*, 15-16

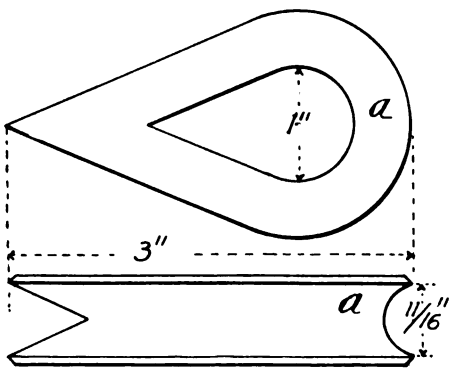

FIG. 15

by 5-32 inch cut thruout its length. On both sides of the adjoining surfaces of the two halves, are cut grooves, shown at *d* and *d'*, and *e* and *e'*. These grooves taper from a width of 13-32 inch at one end to 1/4 inch at the other, the taper on one side running in the opposite direction to that on the other side. The two halves of the clamp are so joined that the wide end of the groove on one is directly over the narrow end of the groove on the other. This arrangement gives a binding grip on whatever is placed between. These clamps are made of galvanized steel, and are used to fasten guy wire. In Fig. 15 is shown a thimble. The side view is shown at *a* and the top view at *a'*. It consists of a piece of galvanized sheet iron bent into the form shown. It is used in connection with looping guy wire, the wire being laid in the groove shown at *a'*.

It now becomes necessary to describe two more articles used in connection with pole-line construction, before the subject of equipping and building a pole line is taken up. These two articles to be described are used in securing the wire, and they are *pins* and *insulators*. Pins are divided into two classes, according to their use. *Standard Pins* and *Transposition Pins*. Both these two types of pins are made in two sizes; one size to be used on standard cross-arms, and the other size on terminal cross-arms. Insulators are of two kinds: *Standard Insulators* and *Transposition Insulators*. In Fig. 16 is shown a standard pin, together with the dimensions required for use as a terminal pin. Referring to the left-hand drawing in Fig. 16, which is that of a terminal pin, the portion marked *b* is introduced into the hole in the cross-arm, and the hood *c c'* rests upon its upper surface. This hood is designed to throw off water. The upper part of the pin *a* is threaded for a distance of 2 1/8

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inches from the top for the reception of the insulator. The shank *b* makes a binding fit into the cross-arm hole and is held in place by one wire nail driven thru the side of the cross-arm. In the

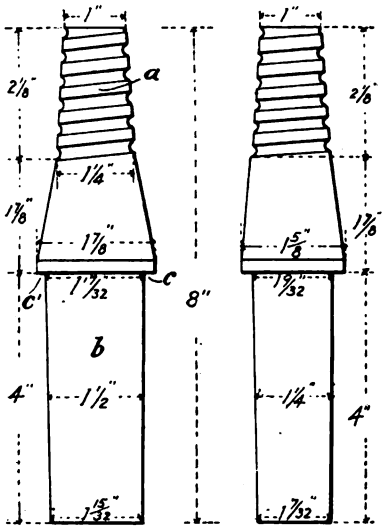

FIG. 16

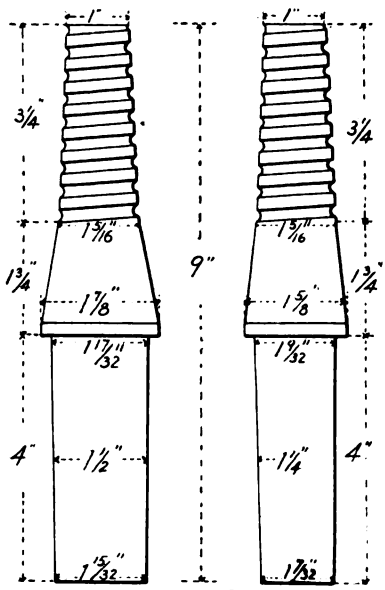

FIG. 17

right-hand drawing are given the dimensions of a standard pin. In Fig. 17 are shown a terminal and a standard transposition pin; the former being on the right and the latter on the left. It will be seen that these pins differ from those previously shown only in the fact that the threaded portion is longer,

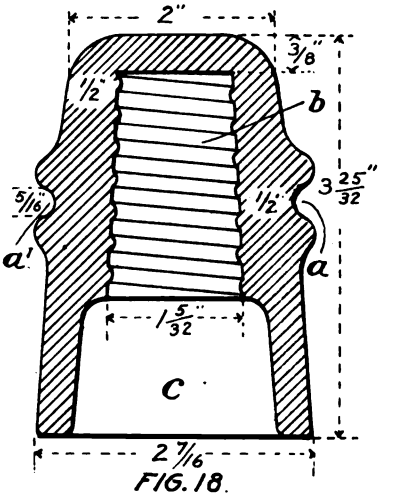

FIG. 18.

being 3¼ inches instead of 2⅛ inches. This change is for the accommodation of the transposition insulator. Locust

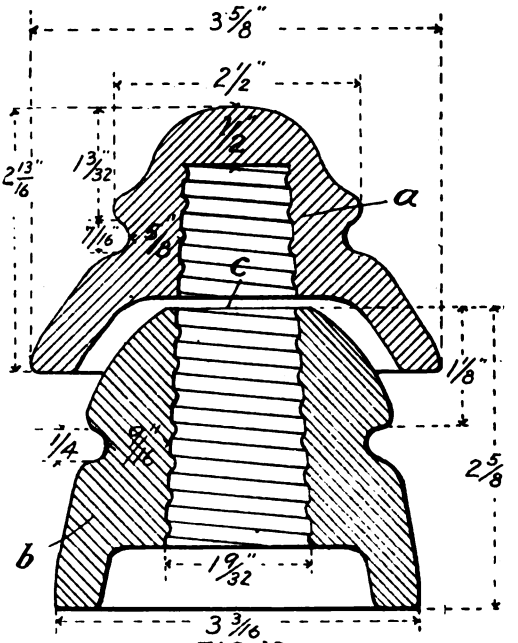

FIG. 19

wood is used almost universally in the manufacture of pins. In Fig. 18 is shown a standard insulator of the most

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approved type. The groove *a a'* is for the reception of the wire. The center is threaded, as shown at *b*, for the reception of the pin. The bottom part is hollowed out to give greater surface area, and reduce the surface leakage. The general dimensions are given. In Fig. 19 is shown the most approved type of transposition insulator. It consists of two separate "glasses"; a bottom glass *b* and a petticoat glass *a*. The bottom glass is hollow and threaded thruout its center, while the petticoat glass is threaded to within ½ inch of the top. Each glass is grooved for the reception of wire. In using, the bottom glass is screwed on the pin as far as it will go; the petticoat glass is then screwed into place, and if all parts fit properly, when both glasses are driven home, a space of about 1-32 inch, shown at *c*, should exist between the two. The best insulators are made of glass. An attempt was made to substitute porcelain for pole-line work, but it proved to be inferior to glass, both in insulating properties and in mechanical strength.

SETTING AND EQUIPPING THE POLE.

Having now described the various pieces of mechanism that are used in pole-line construction, it will be necessary to enter into a discussion of the methods employed in setting and equipping a pole. The location of the poles to be set is determined by driving stakes along the "right of way," about 130 feet apart. Holes are then dug as near as possible to the points occupied by the stakes. The holes should be of the same diameter at the top as at the bottom, and of sufficient size to freely admit the butt of the pole. When the pole has been placed the earth is to be shoveled in, and rammed down continuously until the hole has been filled up. The surplus earth should be packed around the pole. In filling the holes, the coarse earth and gravel should be reserved for the top. The depth to which the holes shall be dug will depend, first of all, upon the length of the pole, and second, upon the character of the ground. For good firm ground the figures given in the following table should be adhered to.

Length of Pole.	Depth in Ground.	Length of Pole.	Depth in Ground.
35 feet	6½ feet	65 feet	8 feet
40 "	6½ "	70 "	8½ "
45 "	6¾ "	75 "	9 "
50 "	7 "	80 "	9½ "
55 "	7½ "	85 "	10 "
60 "	7¾ "	90 "	11 "

When setting poles in marshy or soft ground the figures given in the above table will have to be deviated from; and in many cases artificial foundations must be laid. These cases will be dwelt on later. In setting poles care must be taken to secure them in a perfectly perpendicular position. With a view to appearance, the straightest and best looking poles should be reserved for cities and straight roads, and the crooked and ill-looking poles should be set at corners and in country places. The proper length of pole is determined by the height and nature of the obstacles to be cleared, if any; and by the topography of the country. Where there are no obstacles to clear, and on a level road, 35-foot poles are always used. On the other hand, where obstacles such as other pole lines, houses, trees, etc., must be passed, the height of pole required varies from this figure to 90 feet, according to the height of the obstacle and the manner in which it is passed. When the foreign pole-line is a light or power wire the following rules should be adhered to as a minimum amount of clearance. When the two lines cross each other at right angles a distance of at least 6 feet must intervene between the nearest telephone and the nearest light or power wire. Where the two run parallel, the nearest light or power wires shall be 4 feet outside of lines extended vertically from the extreme outside wires of the telephone line. No light or power wire shall be situated directly over a telephone wire, on account of the resulting crossing of the latter with a high tension line, in the event of the breaking of the former. As a general thing, telephone lines should always cross over, not under, high tension lines. In clearing trees, it is well to allow a liberal clearance so that the branches will have to be trimmed as little as possible. At road crossings the lowest cross-arm shall be at

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least 18 feet above the ground. In crossing railroads great care must be taken to obtain the proper clearance, and the railroad company should always be consulted upon this point.

In regard to the topography of the country, the shortest poles should be placed on the hill tops, and the longest ones in the hollows, so that the line may run as nearly level as possible.

The pole having been set, the next piece of work to be performed is to hoist up the cross-arms and properly secure them. It is done in the following manner: A block is temporarily, but firmly, secured to the top of the pole by a lineman, and a rope tore thru it, both ends resting upon the ground. The cross-arm is then fastened to one end, and the other end is hauled on, till the arm is opposite the topmost gain, when it is seized by the lineman and secured as shown in Fig. 20. The cross-arm *a* is first secured by means of the cross-arm bolt *f*, which is driven, first thru the hole, and then thru the cross-arm. A flat washer *d* is placed under the nut *e* and the latter screwed down hard with a monkey wrench. The two cross-arm braces *c* and *b*, which are fastened to the arm by means of the carriage bolts, one of which is shown at *h*, the nut being shown at *g*. These carriage bolts are driven, first thru the cross-arm, and then thru the brace. The two braces are bent together and fastened to the pole by the fetter drive screw *i*, which is driven into the pole thru the superimposed holes in the two braces. In the end

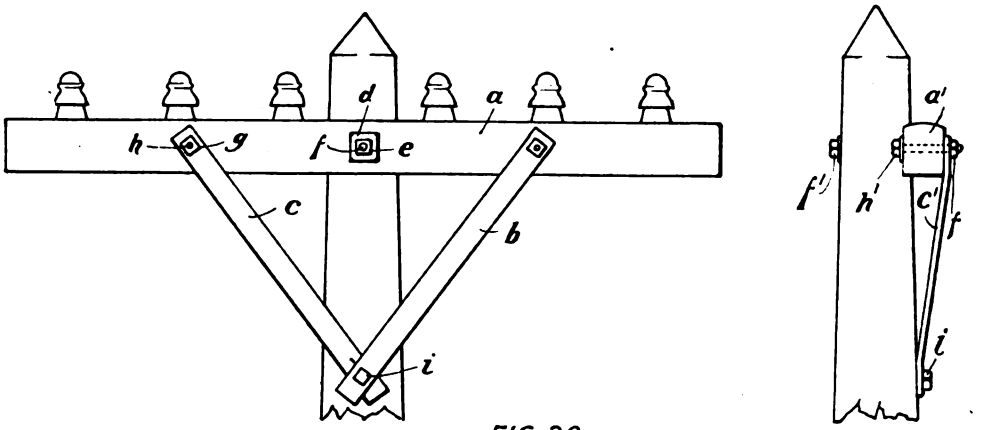

FIG. 20

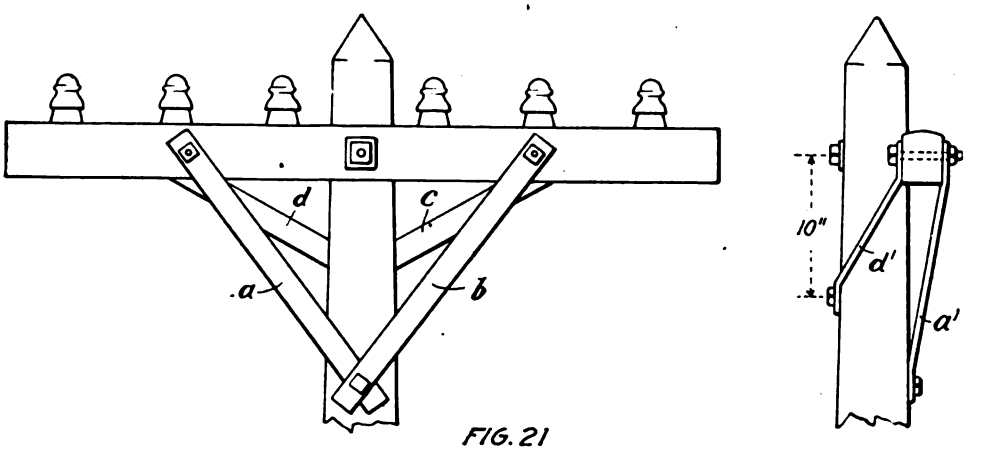

FIG. 21

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view of the pole, the cross-arm is shown at *a'*, the cross-arm bolt-head at *f'*, the carriage bolt-head at *h'*, and one of the cross-arm braces at *c'*. The top cross-arm is placed first, and the lower ones subsequently. On terminal poles, and occasionally on very long spans, or wherever the line turns thru an angle of thirty degrees, special back bracing should be used; and it is attached as shown in Fig. 21. Here the regular bracing is shown at *a* and *b*, and the extra bracing at *c* and *d*. It will be observed that the back braces are attached to the rear of the cross-arm and to the rear of the pole. The method of fastening the back braces is the same as that employed with the regular braces. The point at which the back braces are fastened to the pole is 10 inches below the center of the cross-arm bolt, as shown in Fig. 21, end view. With a view toward equalizing the resistance of the cross-arms of a pole to

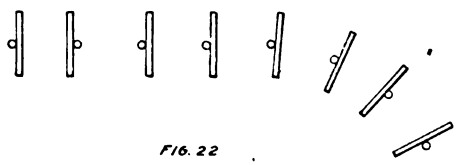


FIG. 22

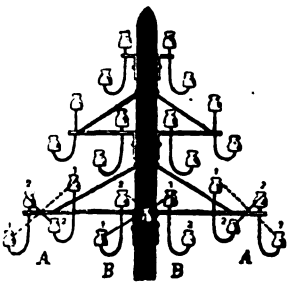
longitudinal strains in either direction, the following practice has been settled upon. On straight stretches the cross-arms are placed on alternate sides of the poles. On curves the cross-arms are placed on the side of the pole facing the center of the curve. At the end of long spans the cross-arms are placed on the side away from the span. These points are illustrated in Fig. 22.

The method of equipping and setting poles having been described, the next step will be to investigate the method employed in reinforcing the poles against the natural strains brought upon them by the tension of the wires, and against accidental strains brought about by local conditions. This reinforcing of a pole line is called *guying;* and the subject of guying will be treated in a subsequent article.

EVERYBODY that can should go to the convention.

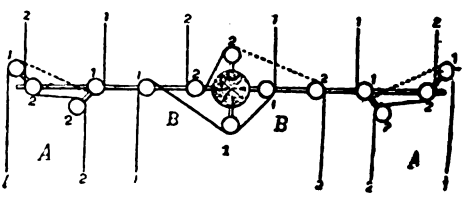
TELEPHONE LINES IN GREECE.

The telephone engineer in charge of the Athens (Greece) exchanges, Mr. J. M. Stratigopulos, writing in the *Technical Journal* describes the system of overhead circuits in use at Athens. Mr. Scandalides, the director of the telephone exchange at Piræus, is the in-



ventor. The cut of the pole top shows the arrangement of the arms and pins, which enables the carrying of a large number of circuits in a comparatively small space. The double pins having an insulator at both the top and the bottom, and their positions being closely calculated, a 40-foot pole with twelve steel cross-arms can carry 156 wires, or 78 circuits. About 30 circuits is all that could be crowded in the same space with the ordinary method of wiring.

The illustration shows a pole top arranged according to the Scandalides system. The main benefit to be ob-



tained in this arrangement is the ease of making transpositions of circuits. This is readily accomplished even when the branch circuits have to be raised or lowered, as is shown in the second illustration.

GOOD DEVELOPMENT.

The Bureau County Independent Telephone Company has 1,300 'phones in operation after two years in business.

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EDUCATIONAL COURSE IN TELEPHONY.

BY A. J. KUSKL.

It would now be well to show the different kinds of batteries, their troubles and the remedies; with a few words on the distinction between open

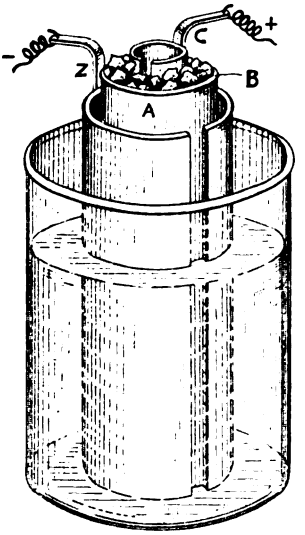

FIG. 9.

and closed circuit batteries. It is readily seen that the inconsistency of the current furnished by a battery to a fixed resistance is largely accounted for by a polarization due to the liberated hydrogen. There are a number of agents which may be introduced into the cell by which the hydrogen may be removed as fast as it is generated, or its disengagement prevented. This element, no matter what it may be, is called a depolarizer. All closed circuit batteries are provided with a like agent, and no battery is entitled to be included in a closed circuit type unless it is capable of working on a closed circuit of moderate resistance for a considerable period. In open circuit batteries this agent may be done away with, or it may be made to act very slowly.

We will first take up the Daniell battery. This was the first closed circuit battery. It was invented by Professor Daniell, of London, in the year 1836. It is illustrated in Fig. 9, and a brief description of the same is as follows: C is a cylinder of copper and Z one of zinc. Between the two is a porous cup A of unglazed earthenware. This is so arranged that a continuous liquid current is maintained between the zinc and copper. The zinc is immersed either in dilute sulphuric acid or in a weak solution of zinc sulphate. The copper is surrounded by a solution of copper sulphate contained in the porous cup. Crystals of copper sulphate are shown in the porous cup. The porous cup serves no purpose except as a partition to separate the liquids surrounding the two plates. Each metal is placed in a salt of itself.

The later forms of this battery have a zinc prism and zinc sulphate in the porous cup, while the sheet copper and the copper solution are on the outside. The action in either case is the same. The gravity battery, which is a modification of the Daniell cell, is shown in Fig. 10, and it is designed to avoid the use of the porous cup. It secures its name from the fact that the zinc and copper sulphates are separated by their difference in specific gravity. The zinc is suspended by means of a stout copper wire from a brass tripod, or in modern practice the zinc

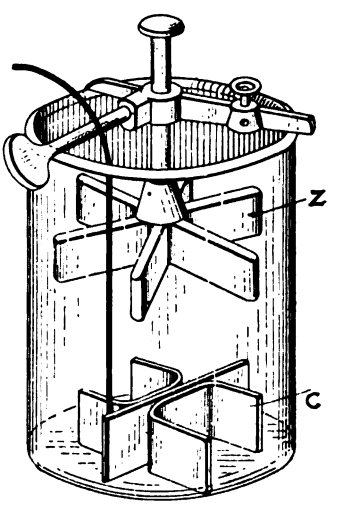

FIG. 10.

is made in the form as shown in Fig. 11. Thin sheets of copper riveted together and fastened to the connecting wire are placed in the bottom of the cell,

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surrounded with crystals of sulphate of copper, which goes under the commercial name of blue vitriol, or blue stone. The zinc casting is suspended in a weak solution of zinc sulphate from 2½ to 3

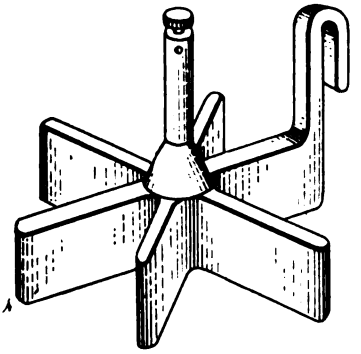

FIG. 11.

inches above the copper plates. In a great many cases the zinc sulphate is not added to the cell. Nothing but diluted blue vitriol is placed in the cell, one part of vitriol to ten parts of water. The acid, acting upon the zinc which is contained in the blue vitriol, causes the formation of a solution of zinc sulphate, which, being lighter, rises to the top of the jar and surrounds the zinc. If water and crystals of copper sulphate are used the cell will not work at first, but as soon as the copper salt reaches the zinc the local action is started. When the cell is properly set up and copper sulphate surrounds the copper element and zinc sulphate surrounds the zinc element, the action of the cell is identical with that of Daniell's.

As this cell is used in a great many exchanges for supplying the switchboard transmitter with current it would be a good plan to say a few words on the care and attention of the same. If the cell is left standing in an open circuit, the copper sulphate passes upward and wasteful local action takes place, hence this cell always keeps in better condition if a closed circuit is maintained thru a high resistance when the battery is not in use. Zinc then replaces copper in the copper salt as fast as it is diffused upward, but the zinc sulphate must occasionally be drawn off and fresh water added. This cell works much better if pure water is used. Crystals of copper sulphate must also be added from time to time and care should be taken so that the crystals of copper sulphate do not lodge on the zinc. It is also a great deal better to only supply the cell with a small number of copper crystals at a time than to place too large a supply in the jar at once. When the water evaporates the zinc sulphate crystallizes around the top of the jar until it finally flows over the top; to avoid this the jars should first be dipped in hot paraffin.

THE GETHIN'S BATTERY.—The inventor of this form of copper sulphate cell has sought to combine the advantages of a Daniell with those of a simple gravity cell. The copper sulphate is placed around the sheet copper in the bottom of the jar, as in the gravity form; while a porous cup, in the shape of a cone, is hung in the top of the jar by means of a stout rim, as shown in Fig. 12. The zinc has a broad, heavy foot, and stands in the porous cup. About four pounds of coarse crystals

FIG. 12.

of copper sulphate are placed in the bottom of the jar, and the jar is about half filled with water. The porous cup, with the zinc, is then put in position, and a weak zinc sulphate solution is

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poured in. The battery is then ready for use. Its E. M. F. is slightly over one volt, and its internal resistance three ohms. Hence only one-third of an ampere can be taken from it, even on short

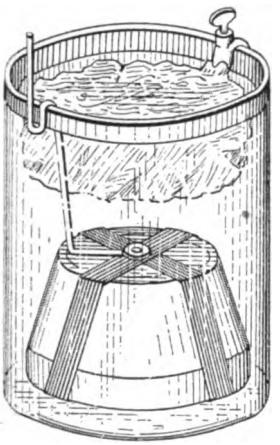

FIG. 13.

circuit: and none of this can be utilized, but all is expended in internal heat. For energy in the external circuit, there must be external resistance in addition to the internal; and hence the current will be smaller, unless several cells are coupled in parallel.

Three of these cells in series will keep a storage battery charged so that it will run a switchboard transmitter for a small office. The storage battery in this case had thirteen plates, six positive and seven negative, each sixty square inches in area. The primary battery was kept constantly connected with the storage battery.

The diffusion of the zinc sulphate outward thru the porous cup is noticeably greater than that of the copper sulphate inward. The level of the liquid outside the cup rises till the difference in hydrostatic pressure counterbalances the difference in diffusive tendency.

DELANY'S MODIFIED GRAVITY CELL. Cells of the Daniell type in which copper sulphate is the depolarizer, have been of such great service when small but constant currents are required, that a brief description of the Delany modification seems desirable.

It is shown in Fig. 13. The copper sulphate is enclosed in a strawboard box and the zinc in a paper envelope. The box prevents the copper sulphate dust from dissolving at once, and diffusing so as to reach the zinc. The copper sulphate solution gradually appears by transfusion thru the strawboard. The copper of the element consists of heavy wire wound in vertical bands about the strawboard box, and an insulated wire rises from this to the top of the cell.

The paper around the zinc prevents the floating, spongy copper or other material falling upon the copper. It is claimed that no stalactites depend from the zinc, and that the deposit on the zinc is easily removed without hacking or scraping. Ordinary gravity cells often need to have this process vigorously applied to them.

A band of rubber cloth is attached by a sticky substance to the inside of the rim of the jar to prevent the crystallized salts creeping over. It is said to present a complete mechanical obstruction to the climbing of the zinc sulphate. It may, of course, be applied to any other jar, first making sure that the rim is thoroly clean; then after warming the sticky side of the cloth, press firmly all around against the rim.

SIR WILLIAM THOMSON'S TRAY BATTERY.—Another form of Daniell cell was designed by Sir William Thomson, with a view of diminishing the in-

FIG. 14.

ternal resistance. The cell is made in the form of a large wooden tray, about 20 inches square, lined with lead on which copper has been deposited by

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electrolysis or during the action of the battery. The lead extends over the outside at the four corners and down under the bottom, for the purpose of making contact with the next cell below.

The zinc is in the shape of a grate, as shown in Fig. 14, which represents five cells in series. At the corners are feet turned upward. The lead of the cell above rests on the upturned feet of the zinc, making a good electrical connection on account of the weight of the cell.

Copper sulphate crystals are spread evenly over the bottom of the tray, and the zinc is made to rest on four blocks of paraffined wood at the corners. A parchment diaphragm is sometimes placed above the copper sulphate, and a dilute solution of zinc sulphate, density 1 to 10, is poured on this till it covers the zinc.

These cells or trays may be piled up to the extent of ten. The internal resistance may be as low as 0.2 ohm. The circuit must be kept closed to prevent copper sulphate reaching the zinc. To secure a fairly constant current, the density of the zinc sulphate must not be allowed to greatly exceed four inches of clear fluid. Some of the liquid at the top must be withdrawn daily, and water must be added in its place.

Sir William Thomson's cell was originally designed to work the siphon recorder in submarine telegraphy.

GROVE'S BATTERY.—The Grove battery consists of a cleft cylinder of zinc immersed in dilute sulphuric acid (1:12), and a thin plate of platinum in strong nitric acid contained in a porous cup. The nitric acid is a powerful oxidizing agent; and, in consequence of this property, it acts as an efficient depolarizer by oxidizing the hydrogen. The nitric acid is easily decomposed, and the strong smelling hydrogen readily abstracts oxygen from it. This completes the action of the battery.

On one side zinc sulphate is formed as usual at the expense of zinc and sulphuric acid; while on the other a molecule of nitric acid loses one atom of oxygen, becoming nitrous acid. As the action proceeds, the nitrous acid may lose another atom of oxygen and become hyponitrous acid. Or further, the nitric acid may break up entirely and become diffused, requiring nitric acid to be replenished.

The products of this cell are water and nitric oxide. This last is a gas which takes up more oxygen on escaping into the air, forming the red fuming nitrogen peroxide. These fumes are highly corrosive, and are the most objectionable feature of the Grove cell. When a large current is taken from a Grove battery, the nitric acid has the appearance of boiling, on account of the rapid disengagement of the nitric oxide. The acid is carried off as a spray, corroding the metallic connections and vitiating the air. The battery should therefore be placed in the open air or in a strong draft, and the connectors should be frequently examined and cleaned.

The zinc cylinders must be kept well amalgamated, and the platinum plates should be heated to redness occasionally to prevent their becoming brittle from some unexplained cause. These cells must be taken apart and washed with an abundance of water every time they are recharged.

They have the advantages of high E. M. F. and low internal resistance. The former is from 1.8 to 1.9 volts, and the latter is about 0.15 ohm, with a cell 20 cm. high and 9 cm. in diameter. Such a cell is therefore capable of giving 12 amperes on short circuit, or thru an external circuit of no appreciable resistance.

When the nitric acid becomes dilute by the process of decomposition in the porous cup, the reaction may become quite different from that represented above. The acid may give up its oxygen entirely, with formation of nitrate of ammonium. The cell then falls in voltage and amperage, but continues to act as an open circuit battery.

The presence of the salt of ammonia in an exhausted Grove cell can be demonstrated by testing the liquid in the porous cup for ammonia in the usual way, by heating with powdered lime and water. A saturated solution of ferric chloride, to which four per cent of nitric acid has been added, has been

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recommended as an excellent substitute for nitric acid in a Grove cell. The E. M. F. is then intermediate between that of a Grove and that of a Daniell.

Another modification of the Grove cell consists in substituting an iron

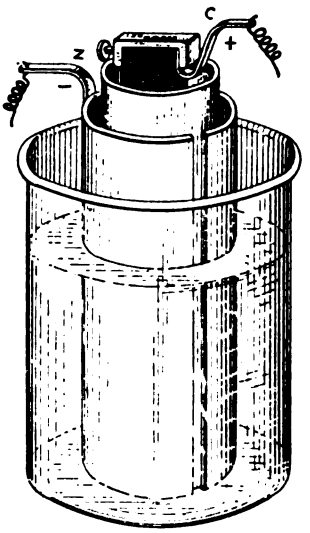

FIG. 15.

plate for the platinum in strong nitric acid. On account of the passivity of iron in concentrated nitric acid, it does not dissolve; and it is strongly electro-negative. When the acid becomes weak, however, by the decomposition due to nascent hydrogen, the acid attacks the iron with disengagement of corrosive fumes. On this account iron is not used in practice for the negative plate.

BUNSEN'S BATTERY.— Soon after the invention of the Grove battery, Bunsen modified it by substituting a prism of baked carbon for the platinum. This is an advantage in point of economy. The E. M. F. is slightly less than that of the Grove. The usual construction of the Bunsen cell is shown in Fig. 15.

The chemical action in the Bunsen battery is precisely the same as in the Grove. The hydrogen is intercepted by the nitric acid, and is thus prevented from reaching the carbon prism by oxidation.

THE BICHROMATE BATTERY.— If the bichromate of potassium or of sodium in solution is treated with sulphuric acid, chromic acid is formed. This compound is not only rich in oxygen, but it gives it up readily to hydrogen. Hence the application of bichromates as depolarizers.

An ordinary Bunsen cell may be set up as a bichromate cell by placing the amalgamated zinc cylinder in dilute sulphuric acid as usual, and filling the porous cup, holding the carbon prism, with a solution of the bichromate salt acidulated with sulphuric acid. Or, since both solutions contain sulphuric acid, the porous cup may be dispensed with entirely, both the zinc and the carbon being immersed together in the strongly acidulated bichromate solution. In this case the zinc is usually placed between two flat plates of carbon, and arrangement adopted simply to reduce the internal resistance of the cell. The E. M. F. does not differ materially from that of the Bunsen.

Fig. 16 represents one of the forms of this cell which has been much used, tho it is not to be recommended. The zinc is attached to a rod, *a*, by means of which it can be drawn up out of the

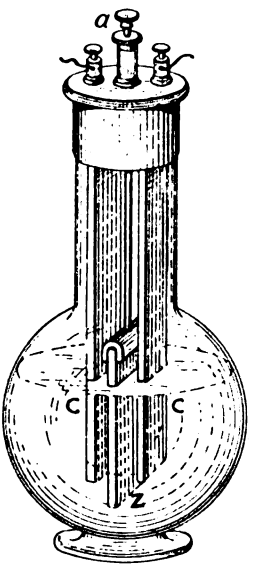

FIG. 16.

liquid when the battery is not in use. The carbon plates are fastened to a metallic clamp, which is attached to the hard rubber top of the cell. The top of the zinc is covered with an insulating

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strip to prevent direct contact with the carbons.

Many forms of "plunge" battery for bichromate solutions have been devised. These are usually arranged as a battery of four or more cells, with the zinc and carbons suspended from a frame, by means of which they may all be lifted out of the liquid together by a windlass. Such a battery is shown in Fig. 17. It is a very convenient form for experimental work.

If the current falls off because of the exhaustion of the liquid in contact with the plates, it may be increased again by

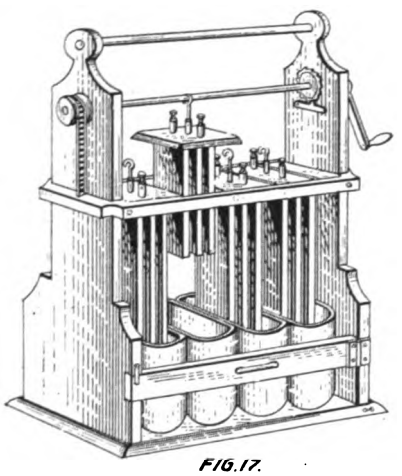

FIG. 17.

lifting the plates, by stirring the liquid, or by blowing air thru, as is done in the Byrne battery.

One inventor gives a slow motion to the carbon plates by means of a small electric motor. Gendron has recently described a bichromate cell, in which the zincs can be easily replaced without interrupting the current. By a system of automatic valves the exhausted liquid is withdrawn at the bottom, while a constant level is maintained by the supply.

The initial E. M. F. of a bichromate battery is a little in excess of two volts per cell.

(To be continued.)

EVERYBODY in the telephone business that has the time and price should go to the convention at Buffalo.

POLES IN THE PHILIPPINES.

A peculiar thing has developed in connection with the telegraph and telephone systems in the Philippines. Great trouble is being experienced in getting permanent poles to support the wires. The ordinary telegraph pole has a life of only one year in that hot tropical country, its base rotting out in that time. If it does not decay it falls a victim to the voracious white ants that abound there and destroy no end of property. The experiment of using iron poles has been tried, but is too expensive. Lately the army men have adopted the plan of utilizing growing trees for telegraph and telephone poles. Where no trees are found in the line of communication they are transplanted. This has been found to work very successfully.

A LOUD-SPEAKING RADIOPHONE.

T. Tommasin, an Italian inventor, has constructed an electric radiophone which can be heard thruout a large auditorium. It is not so sensitive as previous patterns, but still responds to exciter sparks of only 1 mm. length. No relay is used, and the receiver is simply in circuit with a battery and a telephone. While in the ordinary coherers the particles must be free to move, they are embedded in a pasty mass in the new coherer. The author employs silver filings mixed with lycopodium, sulphur, or glass powder, and embedded in glycerin. The electrodes are platinum coils wound on glass. Electric waves impinging upon this coherer produce an increase of resistance which, however, only lasts as long as the impact lasts. The coherer is therefore self-adjusting, and to such an extent that the author declares it to be an interrupter controlled by electric waves. Its efficiency is directly proportional to the strength of the current. At a certain current strength the galvanometer needle becomes nearly stationary, while the telephone responds vigorously. This shows that the interruptions are practically instantaneous.

The instrument is capable of practical application.

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Telephone Magazine

THE ONLY INDEPENDENT TELEPHONE PAPER IN THE WORLD.

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Published on the 1st day of each month.

ELECTRICAL ENGINEERING PUBLISHING CO.

JOHN C. McMYNN, PRESIDENT.

No corporation, firm or person either directly or indirectly interested in the production or sale of telephones or telephone materials of any sort has any connection, editorial or proprietary, with this publication.

The Filosofy of Reducing Telephone Rates.

The yearly contract price for telephones in Paris is reduced from $80 to $60. The Paris-Lyons long-distance rate is reduced from 25 cents to 15 cents. This reduction comes not from the milk of human kindness or the love of fellowmen, but to create a larger profit from a greater volume of business. Precisely this will happen. It would happen in New York or Chicago. The present profits in these two cities satisfy any reasonable stockholder, but they could be doubled. In this present satisfaction lies the future hope of an independent company in these cities. John I. Sabin, the new president and manager of the Chicago Telephone Company, may anticipate a reduction in rate for the increase of business, as his past record in San Francisco and the Coast would indicate. There is no business reason why a telephone service in Chicago costs double that of Paris, nor why a three-minute talk between Paris and Lyons, 245 miles apart, should cost 15 cents, while it takes a quarter to talk between Chicago and any of the suburban towns. A lowering of the rates here for local and long-distance service would bring both within the reach of so great an army of people who use them seldom now that the company would not be a loser, while the public would be a gainer. The Chicago company is introducing a cheaper service in the form of a nickel-in-the-slot telephone. That is earning many a nickel for the company, but rates can be lowered in other directions to the great good of the company and the public.

The number of telephones now in use in New York, or rather Manhattan and the Bronx, is over 60,000. Eight years ago it was less than 10,000. The increase of 50,000 has not been evenly spread over the eight years, but half has taken place in the last two years. The gain for 1899-1900 was 12,500, and for 1900-1901 over 15,000. This rapid growth is due to a comparative lowering of rates in the last two years, and the public's recognition of the fact.

A reduction of telephone rates in Chicago to one-half the present charge would quadruple the business and double the profits.

An independent exchange organized

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on these lines would become a valuable property and a large earning investment.

Simplicity a Virtue in Spelling.

In the *Daily News,* of Chicago, appears an article on "Spelling in the Schools." The writer's conclusion is that the errors in spelling in which both teachers and pupils in our schools are accused, are largely because Superintendent E. Benjamin Andrews gave instructions to principals about one year ago relative to simplifying the spelling of twelve words. "That act," the writer declares, "did much to bring the public school system of Chicago into discredit." Tush! Pooh! Pooh!

What was "that act"? It really must have been most extraordinary to have thus shaken the confidence of the United States in the Chicago public school system.

It is a part of a "Bulletin to Principals," "Series 1898-99, No. 16," and bears date April 30, 1899. It says:

"Concurring in a report to the N. E. A. Department of Superintendence by Commissioner Harris and Superintendents Soldan and Balliet, recommending the simplified spelling of certain words, the Directors of the National Educational Association publish the list of words suggested for modification, adopt the amended spelling for all publications of the N. E. A., and urge that the same be adopted generally.

Said list is as follows:

Tho (though); altho (although); program (programme); thoro (thorough; thorofare (thoroughfare); thru (through); thruout (throughout); catalog (catalogue); prolog (prologue); decalog (decalogue); demagog (demagogue); pedagog (pedagogue).

The "N. E. A." above referred to is the National Educational Association, which is the national association of school-teachers in this country. "Commissioner Harris" is the then and present United States Commissioner of Education — the highest government official of the kind.

What did "that act" consist of, for which Dr. Andrews was not responsible except to say that he favored it? Why, simply chopping away useless, silent parts of words, "me," "ue," and "ough." That is all there is to this matter. Educators who have studied the subject of inculcating into the minds of the young the intricacies, inconsistencies and irregularities of our English spelling, made the feeblest attempt at reform. They chose a very, very few of the worst cases and recommended a change in the direction of simplicity. This process has been going on for three hundred years, but the demand for reformation, speedy and thoro, is louder than ever, owing to the tendency of the age toward simplifying and generalizing. "Publick," "musick," "honour," "favour," "gaol," "cheque," look as queer to us as "through," "catalogue," "phthisic," "æon," "phlegm," and many others will to future generations.

All the modern dictionaries (the Standard, Century and Webster) give about 3,500 words in which amended spellings have been recommended by the joint action of the American and English Philological Societies — the most learned bodies of philologists and linguists of the day, including such men as William D. Whitney, editor-in-chief of the Century Dictionary, F. A. March, consulting editor of the Standard Dictionary, etc. If the *Daily News* and other great periodicals would encourage this movement, obviously so much needed, they would aid much more in helping the rising generation to spell, than

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by throwing cold water and insisting upon adhesion to present forms, no matter how absurd or phonetically incorrect.

One thing is certain, the recommendation in question can not be blamed for poor spelling among the teachers, as they acquired their knowledge under the old system before the frightful ravages of "that act." The old system is responsible for this. Everyone knows that perfect spellers are hard to find outside of professional proofreaders. We wud all be good spelrz if our langwage was simplifyd fonetically. It ot to be.

A COMBINE OF COMBINATIONS.

Information from the East tells of a combination of great magnitude among the telegraph and telephone companies of the United States.

For some time there have been rumors of a consolidation between the Western Union and the Postal companies. It was said that George Gould, of the Western Union, and J. W. Mackay, of the Postal, were inclined to favor such a merger, but the deal met the strenuous opposition of Thomas Eckert, president of the Western Union company, who deemed the consolidation impracticable. However, other officers of the concerns have urged the unification to the end that Gould opened negotiations with the Postal people two or three months ago.

Since then, it is said, the scheme has broadened to include the telephone companies. The promoters now mentioned are Gould, Mackay, and W. Murry Crane. Both Mackay and Crane are the largest stockholders in the American Telephone & Telegraph Company.

Western Union, Postal and American Telephone shares have advanced sharply in the last fortnight, particularly Western Union, which appreciated about ten points within a week.

It is understood that the plan will be submitted to J. Pierpont Morgan. Morgan has regarded such a combination as one that would be highly advantageous for all interests concerned by reason of the great possibilities for economy. Under the present system the telephone and telegraph business of the country is carried on by four separate organizations, which necessitates a quadruple set of employes and wire facilities throughout the United States.

The capitalization of the American Telephone & Telegraph, Western Union Telephone, Telegraph & Cable Company, and the Postal Company, is at present as follows:

	Stocks.	Bonds
American Telephone	$62,127,500	$25,000,000
Postal	13,333,300	18,000,000
Western Union	97,340,615	19,600,000
Tel., Telegraph and Cable	30,000,000	.....

The par value of the shares of all the companies is $100 per share, except the Telephone, Telegraph & Cable Company, of which the par is $50.

SWITCHBOARDS WITHOUT CORDS.

The principle of the old "Umschalter" telephone board has been revived in a modified form by Messrs. Mix and Genest in a cabinet board for small exchanges which they are now introducing with the idea of avoiding the troublesome flexible cord. In it the jacks are arranged in a triangle so as to give the necessary number of combinations, the jacks being marked with the two lines which they connect. There are thus fifteen five-point connecting jacks for a six-line board, the top one being marked 1 — 6, and the lower row consisting of five. Below this is the row of the six local jacks, which are connected to the operator's set merely by the insertion of a loose plug, just as in the case of the main jacks. At the top of the board is a row of six drop indicators employed both for calling and clearing signals, and a corresponding row of jacks in case connections are to be made to other boards, and to the right and left of the triangle are jacks to connect in the bell-end extension bell if required. These boards, which are made in sizes for from three to twenty lines, are described in the *Elektrotechnischer Anzeiger* of May 5.

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A PERTINENT LETTER FROM CANADA.

TORONTO, CAN.

To the Editor TELEPHONE MAGAZINE:

DEAR SIR,—The Bell Telephone Company may thank its own persistency in striving to increase its charges if people make comparison of its rates with those paid in other countries. We in Canada are, of course, fortunate enough to escape the utterly exorbitant rates to which the people of the United States submit, and it is evident that our good fortune is due rather to the vigilance of parliament than to the disposition of the company. But when attempts are made to argue that the company can not make money in Toronto by giving telephones to residences at $25 and to business places at $45 a year, we are tempted to look to Europe for examples to assist us in forming a conclusion. It is possible to conceive a frame of mind which would acquiesce in higher charges here than in continental Europe, for we are inclined to regard with satisfaction the higher standard of prices maintained upon this continent. But what if the service for which we pay is inferior to that given in Austria or in France or in Norway. As a matter of fact, Torontonians who not long ago had occasion to use the telephone in Pretoria were somewhat taken aback to find in that small town in the heart of a distant sub-continent a service which surpassed that to which they were accustomed.

What manner of service do European users of the telephone obtain? Subscribers to the telephone enjoy, of course, the ability to converse with other subscribers, which is the starting point of the whole system. Then in most European countries subscribers are allowed the use of public stations without the charge which non-subscribers are required to pay, a concession undreamed of here. Next may be cited a system of telephone messages which obtains in a number of European countries. A new and unlovely word has been coined to describe such messages—"telephonogram." The article is more admirable than the word. A message can be telephoned, the telephone clerk will write it down, and the written message will be delivered by a messenger, all at very moderate cost. These are advantages which depend absolutely upon the disposition of the telephone companies to extend the service. Again, several services are rendered which depend upon close relations between the telephone company and other public services. For instance, in every European country except Finland a system exists of telephoning telegrams at a recognized tariff which adds very slightly to the cost of the telegram. In Belgium, for instance, about a million telegrams are telephoned to the telegraph office every year, the proportion being one for every five private telegrams and one-eighth of the whole number of telegrams, public and private. The reason for the existence of this close coöperation is that the State, which owns both systems, has come by experience to regard the telephone as a valuable feeder to the telegraph. Finally, the system of telephone letters is worked to great advantage in Germany, Austria, and to some extent in England; it requires cordial coöperation between the telephone and the postal services, and obtains only under the State system. The practice simply means that the postoffice clerk will write out and post a letter dictated to him over the telephone, thus practically extending the time of closing the mails, and supplying telephone and amanuensis in one. "Suppose," says an American writer upon the subject, "a merchant in a town fifty miles or so from Berlin finds that he needs to send a letter to Paris or London after the last mail from his town has gone: he simply telephones his letter to Berlin in time for the night express to Paris, instead of letting the letter wait till the next day, as our merchants in Waltham, for instance, would have to do in case of a similar belated wish to communicate with New York or Philadelphia." The additional cost for such a service in Germany is 2 cents, plus one-fifth of a cent for each word. Finally, it may be added, in nearly all telephone systems on the continent of Europe the plant is excellent; single construction, for in-

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stance, is regarded as obsolete even in Servia and Roumania.

The installation being generally excellent, the service rendered exceeding that accorded us in point of convenience, and the operators being paid wages not greatly exceeding in modesty those upon which our own "centrals" subsist, what are the prices which the European has to pay? In Switzerland, for example, the service is of remarkable excellence, and the tariff provides for a subscription rate of $8 a year, and a charge of 1 cent for each call. In Zurich the calls average two a day for each telephone, thus bringing the annual cost to about $15.25. At an average of eight calls a day the rate would be $37 a year. For the long-distance wire the charge is 6 cents up to 31 miles, 10 cents up to 62 miles, and 15 cents to any point in Switzerland over 62 miles away.

In Austria, again, the State has reduced the charge to $21 a year for any distance up to 9½ miles (15 kilometers). Places like hotels, clubs and railway stations, where the instruments are free to all comers, are required to pay double rates. To have a three-minutes' talk with a neighboring town 12 cents is charged. For a talk with the neighboring states of Bavaria, Würtemberg or Switzerland the charge is 25 cents. For communication between Vienna and Berlin 66 cents is charged.

Luxemburg, a tiny state about forty-four by thirty miles, is strung with a thick network of telephone wires. The proportion of telephones in the capital is 34 to each 1,000, and the uniform charge is $16 a year. In the rather rare instances in which a telephone is more than a mile away from a wire an initial construction fee of $20 for each kilometer is made. Subscribers can use the long-distance wire to any point in the Grand Duchy free of charge. The services and charges will bear quotation, the authority being Prof. Frank Parsons' contribution to the work on "Municipal Monopolies," edited by Prof. E. W. Bemis:

1. Local communication, $6 a year.
2. Interurban communication, free.
3. Telephoning telegrams to or from a subscriber, 2 cents per message, regardless of its length.
4. Telephoning messages to be written down and delivered by messenger, 2 cents per message, plus 7 cents for messenger.
5. Telephoning message to be written down and posted as a letter, 2 cents per letter, plus postage.
6. Public stations — To subscribers, free; to non-subscribers, 7 cents for five minutes' talk with a subscriber anywhere in the State; two non-subscribers talking with each other, each pays 7 cents.
7. Sending messenger to bring a non-subscriber to public station — (a) At call of subscriber, 7 cents and upward, at rate of 3 cents a mile for messenger; (b) at call of a non-subscriber, same, plus 7 cents for use of telephone by caller.
8. Proprietors of hotels and other public places pay the ordinary rate, and may allow their customers free use of the instruments up to 2,000 calls, after which a charge is made of 7 cents a call.

In Holland a private local company at Zutphen, a town of 17,000 inhabitants, possesses an excellent equipment, charges $14.45 a year, inclusive, and makes money. More than a dozen other towns enjoy equally low rates, two getting their service for less than $13 a year. The Netherlands Bell Company charges from $17 to $45 in the towns. To use the trunk lines for long-distance conversations a subscriber pays a special extra subscription of $4 a year and then pays 20 cents for a conversation of three minutes to any part of Holland. Very moderate charges are made for the telephoning of telegrams.

It may be well to set down in tabular form the privileges in which the subscribers to the State system in Stockholm participate; and attention may be directed not only to the comparatively low rate charged but also to the number of additional conveniences which the public enjoy:

1.	Local exchange, average rate	$20.00
2.	Interurban communication within a radius of 43 miles	Free
3.	Interurban connection beyond 43 miles	4c to 26½

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4. International communication:	
3 minutes' conversation with Christiania (270 miles)	40
3 minutes' conversation with Drammen, Drobak, etc. (about 300 miles)	44
3 minutes' conversation with Copenhagen (320 miles)	55
5. Telephoning telegrams (per message, irrespective of number of words)	1⅓
6. Telephoning messages to be written down and delivered (limit of 40 words)	6½
7. Telephoning to a subscriber 40 words in writing handed in at a telegraph or public telephone station	6½
8. Calling a non-subscriber by messenger to a public telephone station	6½
9. Public station service for subscribers or non-subscribers:	
Local conversation in Stockholm	1½
Outside, within 43 miles radius	4
Other interurban conversation	4c to 26½
International conversation same as above.	

What will doubtless attract attention is the remarkably low charge for long-distance messages. Compare with the charge of 40 cents for a conversation between Stockholm and Christiania, about 270 miles apart, the rate of $1.20 in day time and 60 cents at night between Toronto and Detroit, 225 miles apart.

Denmark furnishes its bit of evidence. In that country and in Finland co-operative societies exist with annual charges varying from $10 to $24. In Denmark local private companies make rates almost and, in one case, quite as low. But in Copenhagen the International Bell Company monopoly is established — and there the charge is $41.66.

Norway is in the van in this matter. Christiania, the capital, is a town of about 150,000 inhabitants. The municipality is fortunate enough to own a quantity of stock in the local telephone company which is large enough to give it effective representation in the Managing Council and on the Board of Directors. The exchange lines number 5,000. The yearly cost to each subscriber is $22.25 for the first instrument; for a second telephone on the same line to the same subscriber the charge is from $5.56 to $8.25, and for a second telephone on the same line to another person the charge varies from $8.25 to $11.10. Attention may be drawn to the ingenious variations of charges for additional telephones upon the same line, whereby many European systems manage to give cheaper rates. In this case the rule works so that two neighbors can unite and obtain a good service for $16 a year each. Incidentally, the telephone company has a large reserve, has written off values of buildings and lines, provides relief funds for employes, and pays five and one-half per cent dividend.

The town of Trondhjem, with 30,000 inhabitants, has a showing superior even to this. The municipality has owned the service since 1889, when it bought out an unsatisfactory private company and reorganized the service. The charges are:

For a business place within 1½ kilometers (about one mile) of the central station, per year	$16.65
For a second business connection by the same person or firm	13.31
For a private house, same distance	8.33
For each 100 meters beyond 1½ kilometers	1.37
Average yearly rental for each line	13.25

Within 50 miles of Trondhjem are eleven towns, and subscribers can talk with them at the rate of 4 cents for five minutes. Non-subscribers pay 6½ cents for an interurban and 2½ cents for a local conversation. The municipal telephone service pays interest on the capital invested, insures its employes against death, accident and illness, and sets apart a reserve of five per cent per year on the capital.

Nearly every Norwegian town of 2,500 people or more posseses an exchange, usually either a coöperative society or a local company, at rates varying from $7 to $16 a year, the average being about $10.

But even without citing the most striking instances of cheapness of management which is afforded in Europe, a series of instances can be adduced to show countries where a telephone service is maintained which (a) is as good as or better than that which we enjoy, (b) is far cheaper, particularly with regard to long-distance telephony.

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TALKS AND CROSS-TALKS.

BY THE INSPECTOR.

HINTS TO CORRESPONDENTS.

Write on one side of the paper only, and make sketch or diagram, when necessary. Endeavor to give all the facts bearing on the case, so as to enable the editor to answer intelligently.

Name and address must accompany each letter, not for publication, but for the information of the publisher.

ADJUSTING A RINGER.

In a discussion the other day among a crowd of old-time inspectors the question arose, what is the hardest thing to do on a telephone? Williams, who has been in business ever since the Bell Company started, claimed to adjust a ringer, and I will try and give you the argument as near as possible. A ringer, to be properly adjusted, should be posed so that the hammer lies exactly between the two bells. Now in a great many cases this seems an impossible thing to do. Let us take the ringer as in Fig. 1. It adjusts by the medium of a collar,

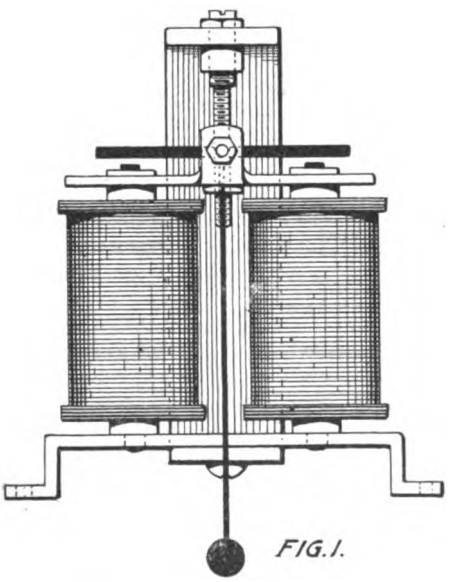

FIG. 1.

nut and screw fastened thru the top of the pole piece. This ringer is a very easy one to pole. One of the best ways to do that is as follows:

Hold the tongue of the hammer loosely in one hand and in the other hand move the adjusting screw up and down. When the armature has reached the zone of proper adjustment it will give a slight pull each way. Hold it there and tighten the set nut, then move your bells an equal distance from the hammer rod. You will now have this ringer adjusted perfectly. The next one, Fig. 2, is still an easier one to adjust. The armature is carried on a rod which slips thru a tube which is secured to the base of the field. The proper way to adjust this one is as follows: Unloosen the set screw and slide the armature up as far as it will go; now tighten the set screw so that the rod will just barely slide with pressure applied. Now by moving the armature with the finger, first to one pole piece, then to another, it will gradually slip downward, then press the tip of the armature with one finger, and when it is just barely drawn down to the pole piece after it has been started and hangs exactly as is shown in Fig. 2, it is then properly adjusted.

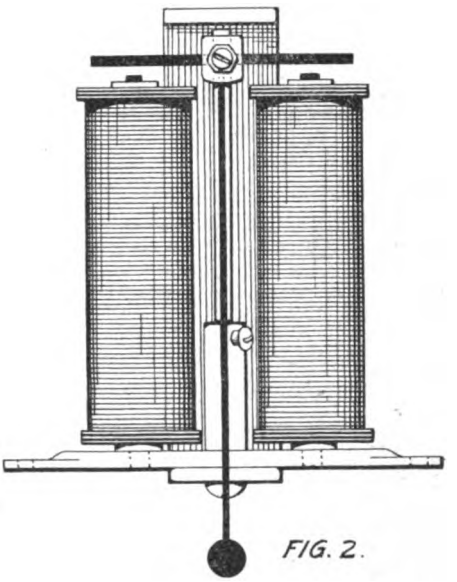

FIG. 2.

Fig. 3 is another style of ringer and

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should be adjusted in the same manner as Fig. 1.

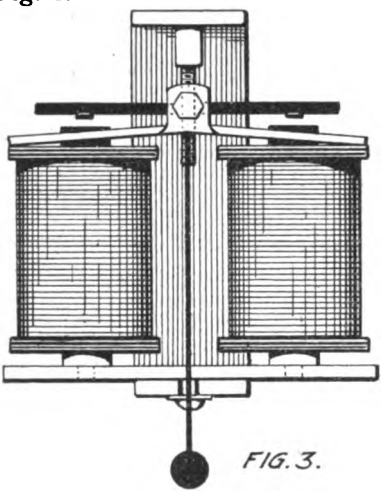

FIG. 3.

Fig. 4 is another style. This is a mean one to adjust, and while the principle mechanically is good, it is a very hard one to adjust properly. The armature is supported by a bridge which extends to two columns outside of the pole pieces as is seen in Fig. 4. The top

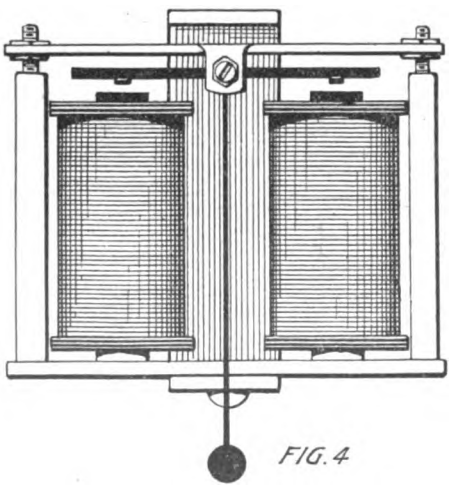

FIG. 4

of these pole pieces is threaded. There is a nut under this bridge and one above it, and the adjustment is raised or lowered by the raising or lowering of these nuts. On account of the difference in threads it is sometimes very hard to get this bridge perfectly level. When this is impossible to do, it is best to bend the hammer rod a little. This, in most cases, should be avoided.

Fig. 5. This is one that is gradually going out of practice and it should, for it is a very poor principle to adjust by. It is very easy to adjust, but, while the hammer may be adjusted in the proper position, the distance between the armature and pole piece may not be right. It is adjusted by the two screws which pass thru the bridge and bear down upon each side of the armature. Sometimes in adjusting these bells some of our young electricians bend the pivot of the armature away out of place, thereby ruining the ringer. This bell

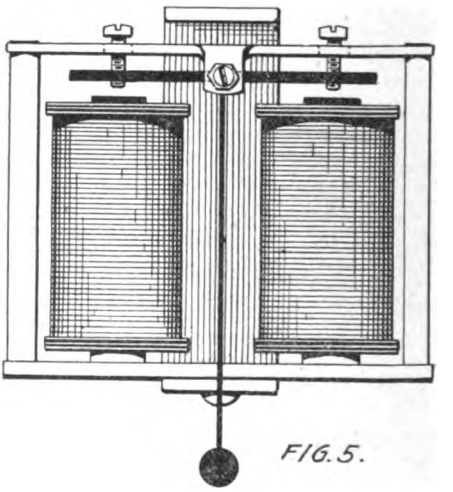

FIG. 5.

should be made to find its own adjustment the same as that described in Fig. 1, and then the screws should be lowered to the proper position. I would be pleased to have my readers express their opinion of what they think is the hardest thing to do about a switchboard or telephone.

---

115. Is the Leclanché cell a primary or secondary battery?

Respectfully yours,
J. H. R., Madison, Wis.

Both the Leclanché and dry cells rank in the primary class. The Leclanché can not be classed as anything else but a primary battery, while some dry cells possess the peculiar phenomenon of taking a current and giving out this current, but this is with a great loss, as they do not give out fifty per cent of the current they receive. This is due to the fact that their mechanical and chemical arrangement is such that

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they form a poor sort of chloride accumulator, but, of course, this does not allow them to be classed as a secondary battery. I would refer you to the educational course now running in THE TELEPHONE MAGAZINE for further information on batteries.

---

116. How are the carbon fuse blocks connected? Please explain why the different connections are made.

Respectfully yours,
A. B. H., St. Mary's, Ill.

It would take more room than I am allowed, to show you all the different carbon fuse blocks, but in the common kind such as Fig. 6, where the line enters one side of the clip and passes on out thru the fuse to the other clip, the ground connection is made to one side of the carbon and the other side of the

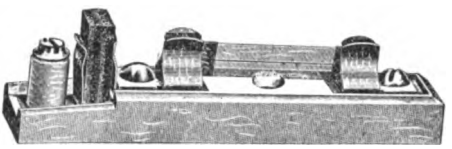

FIG. 6.

carbon is connected to the incoming side of the clip. Both sides of the carbon block are separated by a piece of mica or silk interposed between. This has several small holes cut into it, and it is now presumed that a discharge of lightning comes. It passes on across the fuse to one side of the carbon and as there is less static impedance between the two carbon blocks than there is thru the 'phone to the ground, the discharge passes to the ground. After a heavy storm these carbon blocks will need to be removed and the dust blown away from them. This dust is due to the disintegration of the carbon caused by the discharge of lightning. If this dust is not removed it forms a continuous line of conductivity between the ground and the line, thereby grounding the 'phone.

117. We are having to build party lines (in opposition to Bell Company or Central Union) at $1 a month and use costly bridging 'phones. Parties object to the ringing so much when 8 or 10 or 14 on same line. Is there not some system of signals that can be used to reduce the amount of ringing? If so, I would like to get hold of some or one to answer, say, 20 people on line. Will you please refer me to some one I can get signals from, and greatly oblige

Yours truly,
H. H., Washington C. H., Ohio.

There are a number of selective signal systems on the market today, but the Inspector has never had any practical experience with them, so hesitates in giving his opinion as to which is the best, but as the different manufacturers would be pleased to send you descriptive matter I would advise your writing to them. You will find several of them advertising selective signal systems in this number. You will be able to get something which is suitable for your needs, and any of the selective signals which are put upon the market today are all good.

---

118. Similar to No. 97, we have a grounded bridged line six miles long, on the same cross-arms with two transposed metallic circuits sixteen miles long. The two metallic circuits do not cross-talk, nor does the grounded line cross-talk with the metallic lines, but you can hear everything on the grounded line that goes over the metallic lines. The only induction seems to be from the metallic lines to the grounded line. Practically no induction between the two metallic lines, nor any apparent cross-talk when the grounded line is busy, and you listen on either metallic line. Why can you hear the cross-talk on the grounded line only?

Respectfully.
G. P. S., Gibson City, Ill.

I would advise you to transpose as shown in Fig. 7; this transposition ought to be inserted every quarter of a mile, and ought to have the desired effect to remedy this trouble. The reason of this cross-talk, and that it can only be heard in the grounded line, is as follows: The two metallic lines run-

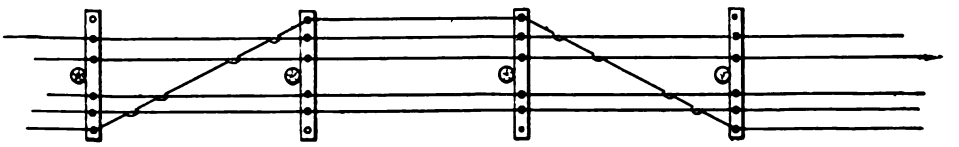

FIG. 7.

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ning parallel with the grounded line affect the grounded line in the following manner: The grounded line has the stress to induce the current from the metallic line; both metallic lines being balanced they exhibit no stress toward each other nor to the grounded line, but there being a difference in the resistance of the grounded line proper and the ground it makes the grounded circuit an unbalanced line, which would be bound to draw all the inductive disturbances. The method of transposition shown, while it would do nothing to balance the line, would have an effect to neutralize the stress and by doing so do away with the induction.

---

119. We have a grounded toll line eleven miles long coming in to the exchange on the same poles with a metallic line 1½ miles in length with no transpositions. Cross-talk is bad. What is the remedy?

Yours truly,
C. E. S., Sterling, Kas.

The answer to your question and the remedy for the same is fully explained in No. 118. The diagram will also serve in your stead.

---

120. We have a grounded toll line twenty-five miles long on which we have four bridging 'phones wound to 1,600 ohms. At one end, which is Grant's, we use a bridging 'phone with carbon battery; at the other end, which is Goldendale, we have our switchboard, to which the other end of this toll line is attached. On our switchboard we use gravity battery. We would like to connect to the extreme ends of this toll line a set of telegraph instruments, but in such a way that they would not interfere with the 'phones or they to interfere with the dispatching of messages. We have on hand one open W. U. relay, 150 ohms, one box relay 500 ohms, two sounders, two keys. Now we would be pleased to have you instruct us how to connect up, and also what additional material we will need to add to the line in order to perfect our aims. Enclosed find rough sketch of line and 'phones as they appear. Thanking you in advance, we are

Yours respectfully,
G. T. T. Co., H. J. W., Mgr.,
Goldendale, Wash.

Of course, you could not obtain simultaneously telegraphy and telephony with a grounded line, but these two can be made to work independently of each other in the following manner: By inserting 1,600 ohms resistance coil between one side of the relay and the ground as is done in Fig. 8. You will have to have both your relays of the same resistance. Of course, on this line when you are telegraphing over it and anybody should take down their telephone receiver they would be able to hear the sound of the instruments. This is due to the fact that the pulsating current would affect the receiver the same as it would the relay.

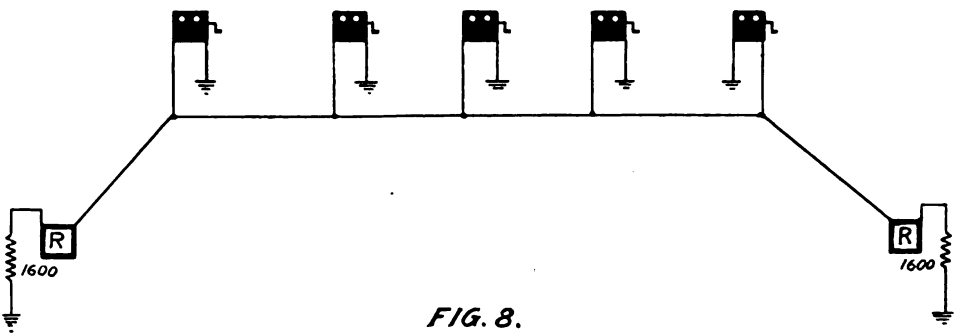

FIG. 8.

121. We have decided to change all our toll and party lines to 1,600-ohm ringers, where they are now 1,000 on our line, 2,500 on another and 3,500 on another, with from 10 to 16 on each line, all 'phones on each line being the same. Now can we use the same generator on this 1,600-ohm ringer, or will we have to bring the amperage up with coarser winding? Yours respectfully,

B. F. W., Farmer City, Ill.

It will not be necessary for you to change the winding of your generators, for all good bridging generators are wound so that they generally give out about twice the output in amperage that they are intended to, consequently you should have no trouble in making this system work. It is a good plan to have all your ringers of a like resistance, and you are making quite an advance in the construction of your system then.

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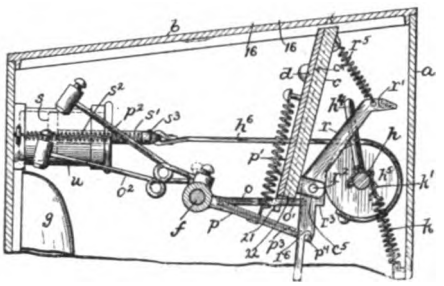
MONTHLY DIGEST OF TELEPHONE AND KINDRED PATENTS

EDITED BY CLARENCE C. BROWN.

Copies may be had, postage paid, by enclosing 5 cents for each one. Address inquiries in care of this magazine or Washington, D. C.

WILLIAM A. FOSS, CLEVELAND, OHIO.—TOLL-COLLECTING MACHINE FOR TELEPHONES. No. 672,035, April 16, 1901.

The object of this invention is to provide a toll-collecting device which will admit coins of more than one denomination, and give a respective signal for each coin. It is so arranged that when

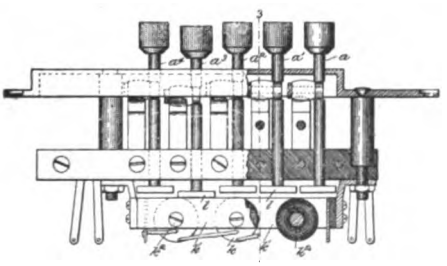


No. 672,035.

a coin of a certain size drops in the proper slot, the lever which is actuated by the subscriber causes the gong of one tone to respond. This being in close proximity to the transmitter the operator is then enabled to know the denomination of the coin, as each respective slot has a different sounding gong. A side view of the apparatus is shown in the illustration, which shows the hammers for a three-coin machine.

WILLIAM W. DEAN, CHICAGO, ILLINOIS.—RINGING KEY. No. 672,122, April 16, 1901.

This invention could rightfully be termed a continuous ringing key, for

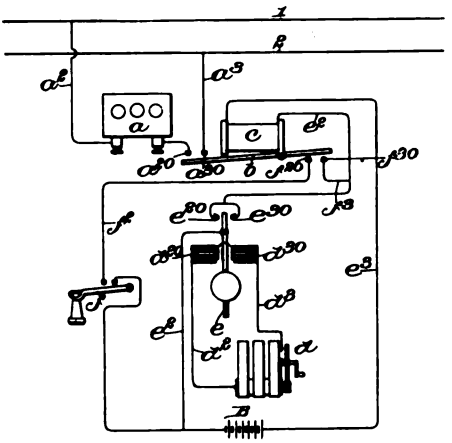


No. 672,122.

it is so arranged that when once depressed it is held down by a sticking magnet until the called party answers by removing its telephone from the hook. The energizing circuit of the magnet is controlled thru the agency of the switch at the substation. When the called party answers, the circuit is broken and the key is released. The illustration shows a set of these keys arranged with this invention. While this device is a very good thing, it has a very serious fault. If the place of business should be closed the bell would continue to ring for quite a period before stopped by the operator. This, however, can be easily remedied.

N. H. HOLLAND, BROOKLINE, MASSACHUSETTS. TELEPHONE METERING SYSTEM. No. 672,064, April 16, 1901.

This is another telephone meter. In the present invention each instrument is provided with a circuit controller which eventually controls the meter;



No. 672,064.

the circuit controller being arranged so that its operation is intermittent or constant, in response to the operation of the signal-sending device; it being immaterial whether the said operation is performed mechanically or electrically. In the illustration it is arranged to be performed electrically. Referring to the drawing the meter circuit is normally

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open, but it is adapted to be closed by circuit closer *b;* this is an arm arranged to be operated by electromagnet *c,* and is so located as to bridge the terminals *a*20 and *a*30 when the said electromagnet is energized. The primary closure of the electromagnet circuit may be performed by the operation of mechanical or electrical devices, and is so arranged to set in operation an intermediate timing device adapted to operate for a predetermined time after the initial impulse is finished and then to cease its operation so that it has no further control over the magnet circuit.

ALBERT K. ANDRIANO, SAN FRANCISCO, CALIFORNIA.— INTERCOMMUNICATING DESK TELEPHONE. No. 672,662, April 23, 1901.

This is a desk telephone which provides for the intercommunicating switch

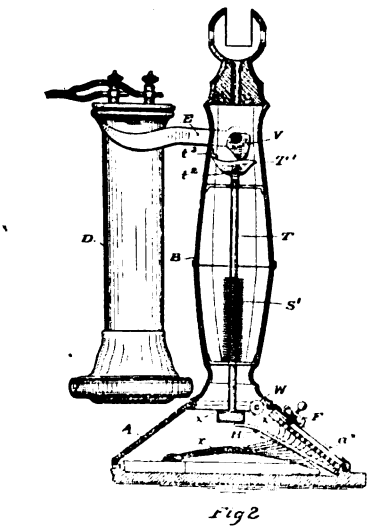

Fig 2

No. 672,662.

to be placed in its base, and also provides that when the hook is replaced, all switching connections are restored to normal. There are a great many of these devices, but this one seems to be free from complications and ought to be a good one. A glance at the drawing explains its mechanical operation.

D. M. BLISS, LOWELL, MASSCHUSETTS.—TELEPHONE METER. No. 672,546, April 23, 1901.

In this invention each telephone is provided with a recording instrument which may be of any suitable or usual kind, and may be operated electrically in response to the action of a pulsating or alternating current, and while two telephones are in use the pulsating current is superimposed on the line so as to operate one or both of the instruments then in circuit. It being usual, however, to have only one of the said instruments operated, so that only the calling subscriber may have the call

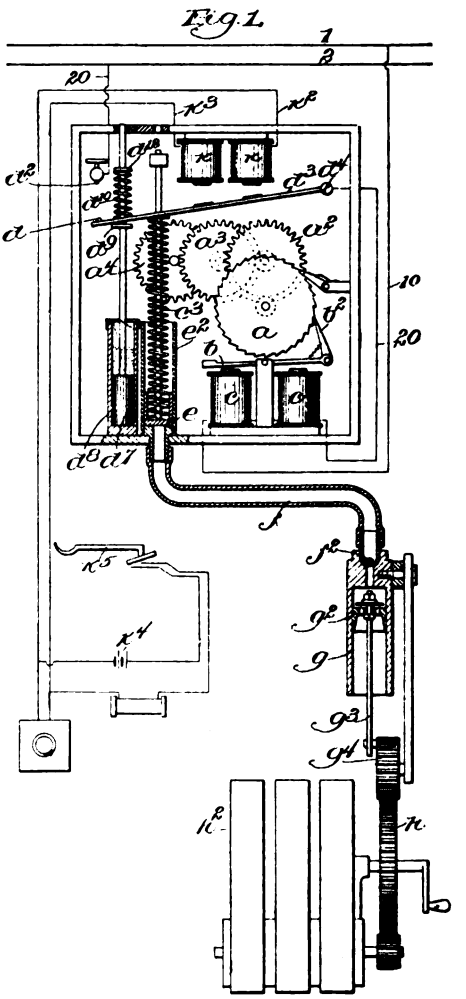

Fig 1.

No. 672,510.

recorded. In this invention it would be well to refer to the drawing. This is shown in connection with one telephone and a brief description is as follows: As a trail of wheels *a, a*2, *a*3

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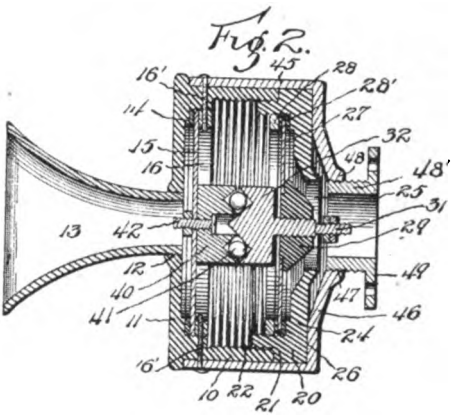
and *a4*, of which *a* is the driving wheel, adapted to be actuated by means of a pawl *b2*, carried by a vibrating armature *b*, the pawl being adapted to operate with rachet wheel on said wheel *a*, the armature *b* is arranged to be acted on by an electromagnet *c*, which is adapted to be connected by a circuit 10, 20, with the line wires 1, 2 of the main telephone circuit, so that when the telephone is in use and the pulsating current in operation the said pulsating current will pass over the main line 1, 2, thru the coils of magnet *c*, causing the armature *b*, which is polarized, to vibrate and rotate the wheel.

C. C. HUGHES, BALTIMORE, MARYLAND.—TELEPHONE TRANSMITTER. No. 672,621, April 23, 1901.

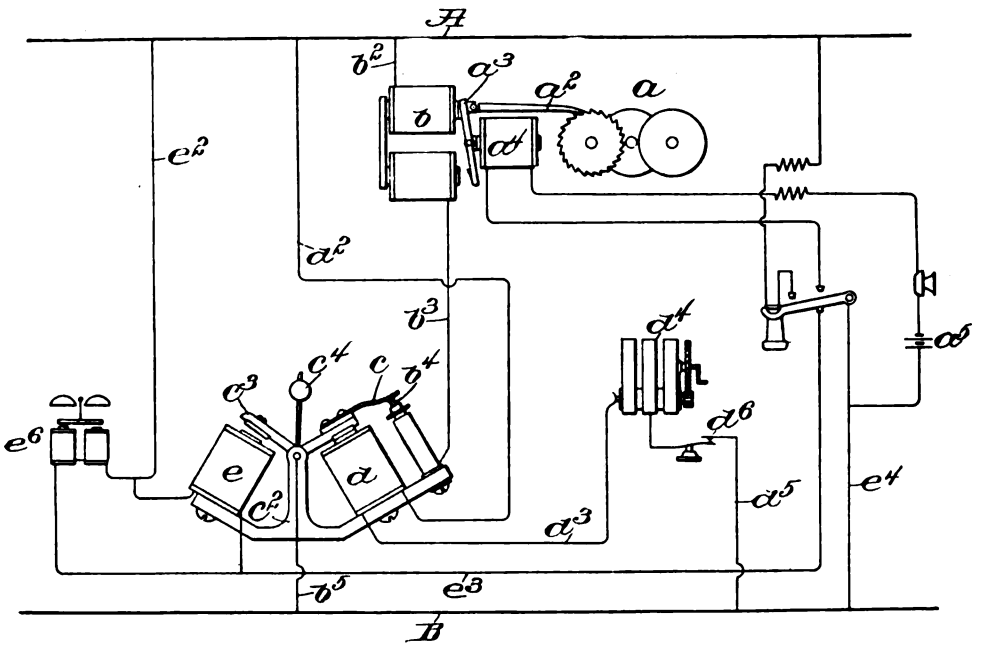
In this transmitter granual carbon is done away with, and in its stead carbon balls are used. The drawing is self-explanatory.

D. M. BLISS, LOWELL, MASSACHUSETTS.—TELEPHONE METER. No. 673,072, April 30, 1901.

This invention relates to what may be termed meter-controlling devices, which are arranged in accordance with the invention so that the meter is placed in condition to operate only when a signal is sent from the instrument where the meter is located. The meter being prevented from operation at any instrument where a signal has been received, therefore, each subscriber will have recorded at his instrument the number of times or length of time he has used his instrument at his own volition, there being no record of the time he has used his instrument when called by other subscribers. This invention is in-



No. 672,621.



No. 673,072

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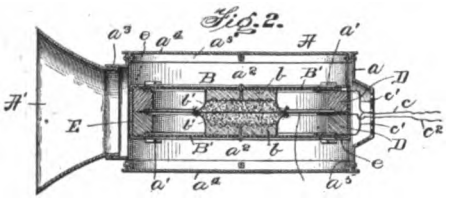
tended to be used together with patent application filed November 7, 1899, serial No. 738,470. The drawing shows the meter in connection at the subscriber's station.

C. E. YOCOM, NEW YORK.—TELEPHONE TRANSMITTER. No. 673,350, April 30, 1901.

This is a form of double diaphragm transmitter. It also provides for double carbon receptacle. It is a very simple



No. 673,350.

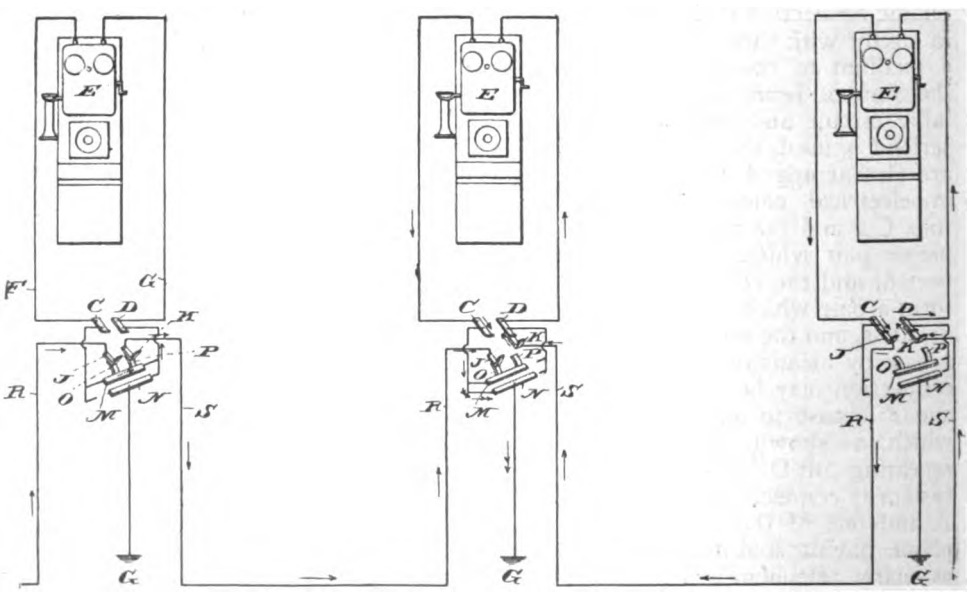
diaphragm transmitter and may be readily understood by the aid of the accompanying drawing.

P. J. WENDELL, OPHEIM, ILLINOIS.—TELEPHONE SWITCH AND CUT-OUT. No. 673,344, April 30, 1901.

The object of this invention is a switch and cut-out for use in such systems whereby a telephone in such circuit may be completely cut out of the circuit and the circuit be shunted past the telephone without interrupting the work of the other telephones in the circuit, or the telephones may be cut out, either right and left, from either direction, while kept in circuit with all the other instruments in the line in the opposite direction, and this too without destroying the operativeness of the portion of the circuit from which it is cut out. This device ought to be quite useful in either bridged or series lines, for the fact that one telephone being out of operation it does not affect the rest of the system.

H. P. SNOW, ERIE, PENNSYLVANIA.—TELEPHONE EXCHANGE SYSTEM. No. 672,967, April 30, 1901.

This invention covers a method of switchboard mechanism and method of connection in a trunking system. Referring to the drawing the general scheme of the switchboard when applied to this system of wiring is shown. A marks the incoming wires and B the outgoing wires, the terms "incoming" and "outgoing" wires being used simply for convenience. There are ten of the incoming wires in the series (marked from A 1 to A 10) and ten of the outgoing wires (marked from B 1 to B 10). The wires A are connected



No. 673,344.

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with a series of plates *a*, insulated from each other, and the wires B are connected with a like series of plates *b*, also insulated from each other and separate from the plates *a*. The plates *a* are lettered from *a* 1 to *a* 10, the plate *a* 1 being connected with the wire A 1, and the plate *a* 10 with the wire A 10, with the intervening plates connected with intervening wires in their order. A like system of lettering is employed with regard to the plates *b*, the plate *b* 1 being connected with the wire B 1 and so on. Extending across the plates are a series of movable rods, arranged in pairs, C 2, C 4. A like series of movable rods C 1 are arranged over the plates *b* and are also arranged in pairs C 3 and C 5. Contacts *c* are arranged on the rods CC 1, which are adapted to be brought by the movement of the movable rods into contact with any of the plates *a* and *b*. Rods C 2 are connected by wire *d* with the rods C 3, and the rods C 4 are connected by a wire *d* 1 with the rods C 5. It will be noted, therefore, that the rods are arranged in couples or pairs and that each pair are capable of forming a telephonic connection if the wires *d* and *d* 1 in circuit with them are connected with a medium to complete the circuit, as the common return wire. Where a metallic circuit and selection system described is used, these rods and brushes are also arranged in couples which are in electrical connection, namely, the rods C 2 and the rods C 3 form a couple or pair which are electrically connected, and the rods C 4 and C 5 also form a pair which are in electrical connections, and the rods C 2 and C 4 form a pair by means of which a telephonic connection may be made. The wires *d* and *d* 1 pass to an inductive repeater which, as shown, is in the form of a repeating coil D. Each telephone in the system is connected to one of the wires A and one of the wires B, each telephone having a different combination, as many telephones being possible as there are different combinations of the wires, as more particularly pointed out in the former patent referred to. There are shown four telephones connected with the line wires in this manner. They are numbered 10, 10; 9, 10; 11, 9; and 9, 9. The telephone 10, 10 is connected with the wires A 10 and B

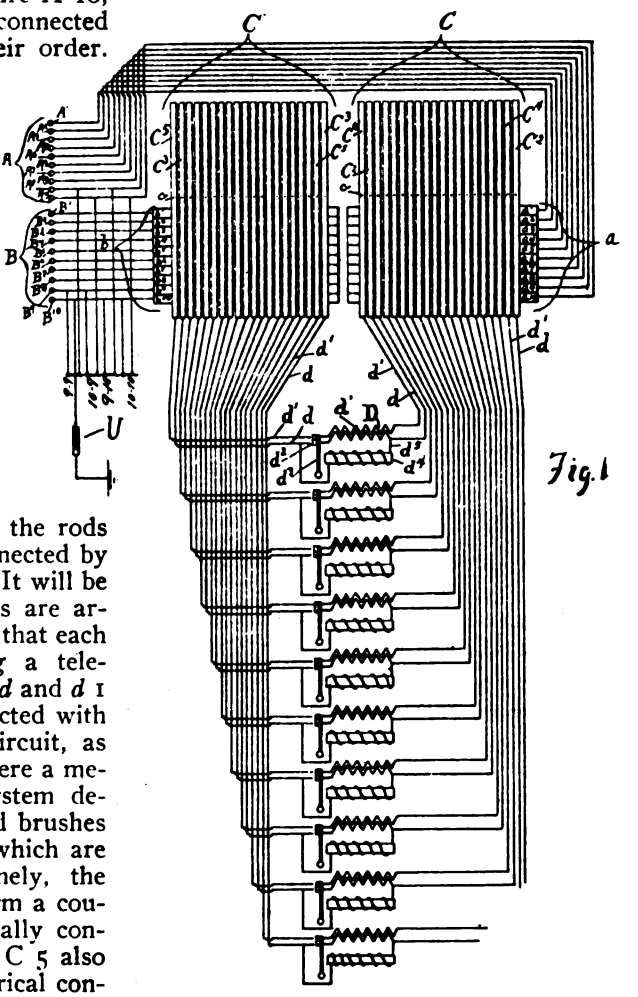

Fig. 1

No. 672,967

10. The telephone 9, 10 is connected with the line wires A 9 and B 10. The telephone 10, 9 is connected with the wires A 10 and B 9. The telephone 9, 9 is connected with the wires A 9 and B 9. This method of connection is carried out thruout the system. Independent line wires may run from each telephone into the exchange and there

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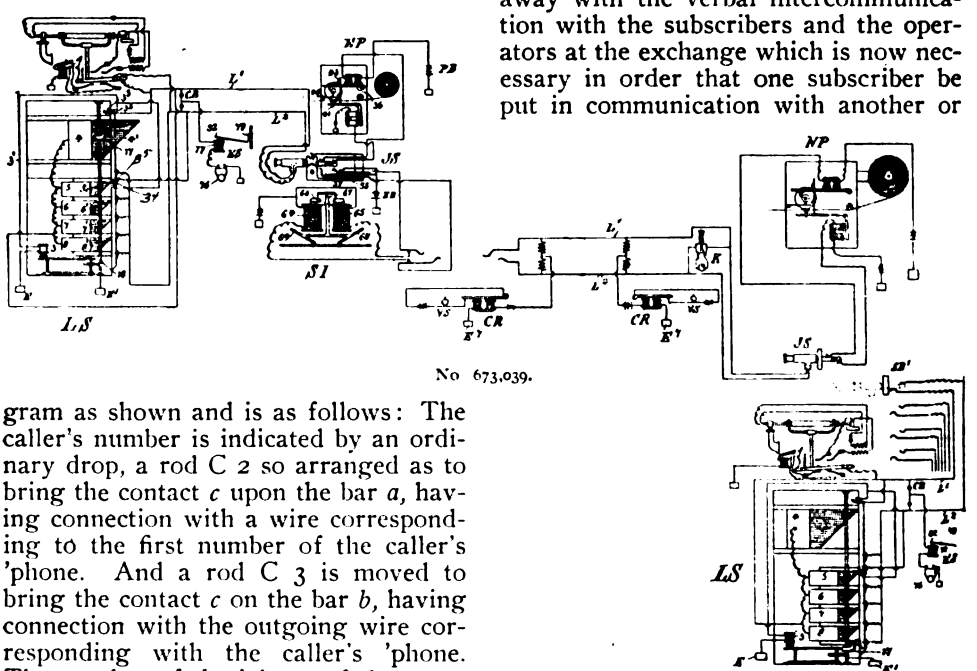
be connected. With this system the switchboard wire (wires A and B) may also extend out from the telephone exchange and the wires immediately connected with each telephone simply run to the line wires. The system of 'phone indicator may be and preferably is arranged with two numbers; as, for instance, a 'phone connected with the wires A 1 and B 1 might be numbered "1, 1," and the 'phone connected with the wires A 4 and B 7 might be designated by the double number "4, 7." In the systems of less than one hundred 'phones a single number may be used, as "11" for the "1, 1" number above referred to, and "47" for the other; but in large systems the most convenient method is to have the double series of numbers, as above referred to.

The general operation of the device can be readily understood from the diagram as shown and is as follows: The caller's number is indicated by an ordinary drop, a rod C 2 so arranged as to bring the contact *c* upon the bar *a*, having connection with a wire corresponding to the first number of the caller's 'phone. And a rod C 3 is moved to bring the contact *c* on the bar *b*, having connection with the outgoing wire corresponding with the caller's 'phone. The number of the 'phone of the party called is ascertained; then the rod C 4 which is connected with the same repeater D, as is the wire *d*, the rod C 2 being already moved, brings its contact *c* on the plate *a*, corresponding to the number of the 'phone of the first party called. A similar operation is pursued with reference to the operation of the rod C 5. It is moved so as to bring the contact over the plate connected with the wire corresponding to the second number of the party called. It will be readily seen that as the rod C 2 and C 3 are brought over the bars which are connected with the outgoing and incoming wire of the caller's 'phone, a circuit is established with the 'phone of the party called, thru the wire D and the coil D. Electrical energy is conveyed from one to the other circuits thru induction in the coil D so that a perfect telephonic connection is established between the caller and the party called.

A. T. M. THOMSON, EAST DULWICH, ENGLAND.—TELEPHONE SYSTEM. No. 673,039, April 30, 1901.

The object of this invention is to do away with the verbal intercommunication with the subscribers and the operators at the exchange which is now necessary in order that one subscriber be put in communication with another or one exchange with another, as the case may be, and to substitute what may be called a secret service, which also does away with the present multiple switchboard, thus reducing the cost of maintaining and operating. The invention consists in certain apparatus and in the group or combination of these apparatus



No 673,039.

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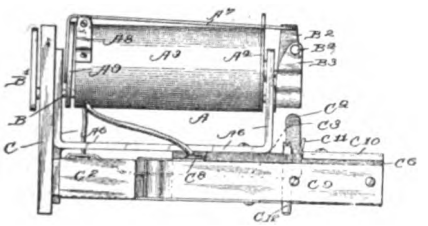
comprising signaling, printing and indicating devices, which provides for a system by which the calling party may operate a dial which causes a machine at central office to print the number of the party desired. The connections may be readily seen in the drawing.

I. J. KUSEL, CHICAGO, ILLINOIS.—TELEPHONE SWITCHBOARD. No. 673,504. May 7, 1901.

This is a combined drop and jack where the shutter falls sideways on a plane parallel with the face of the board.

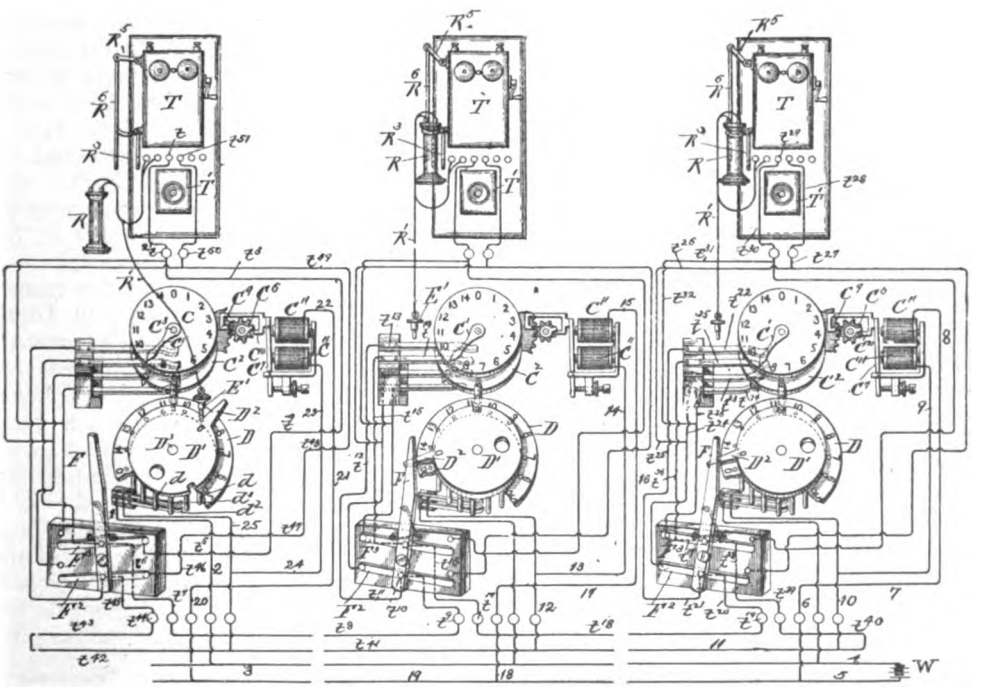


No 673,504.

It also provides for the same shutters to be restored by the insertion of a plug in the jack. It also provides for night bell contact to be made on the back of the drop, and is arranged mechanically so that each drop and jack may be removed from the switchboard proper without affecting any other drop or jacks, or disconnecting any other connection other than its respective line connections. It is also arranged that the lip which holds the shutter in place can only be raised by the contraction of the armature due to an electric current, thereby preventing the shutter from falling down as a result of jarring or other mechanical disturbances. It also does away with a number of springs in the jack. The core and coil proper are protected with a shield of magnetic material. The drawing shows the drop and jack in detail.

U. S. JACKSON, OSSIPEE, NEW HAMPSHIRE. AUTOMATIC SYSTEM. No. 673, 796, May 7, 1901.

This is a telephone automatic system arranged differently from all previous systems. The simplicity of this device can be readily seen by the accompanying illustration, which explains this patent fully.



No 673,796.

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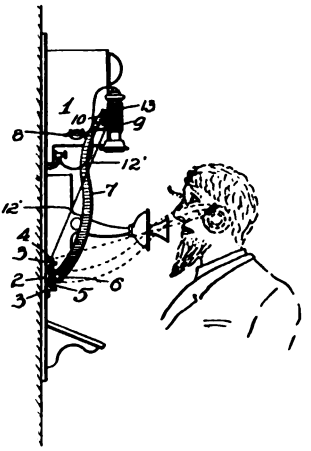
M. LONDON, MCKEESPORT, PENNSYLVANIA.—TELEPHONE RECEIVER HOLDER. No. 673,211, April 30, 1901.

This is another method of holding the receiver to the ear by mechanical means. The drawing illustrates this fully.



No. 673,211.

TRADE NEWS.

THE Sterling Electric Company, Lafayette, Indiana, has just issued an attractive booklet on its selective signal non-interfering party-line telephones. If you did not get a copy send in your address. These 'phones are giving excellent service wherever they are installed. The company reports that it is impossible to keep up with its orders, and is increasing its force every day.

THE Maltby Lumber Company, of Bay City, Michigan, recently suffered quite a loss in the fire at Detroit, Michigan, which wiped out the pole yard of the Western Union Telegraph Company. They had some 15,000 poles stored there, and the telegraph company had nearly 100,000. The two together made by far the largest stock of poles in one place, of any yards in the world. The destruction of this large amount of cedar poles will doubtless have a strong effect on the pole market, as the telegraph company has a large amount of construction work under way and will have to purchase at once. The Maltby Lumber Company has numerous other yards, notably at Pinconning, Saganing, and Boyne Falls, Michigan, and the loss will not deter it to any large extent in making shipments. In fact at the present writing it is loading one of the largest capacity pole boats on the lakes a second time for shipment to the burned yard, and has chartered her for three more trips. In addition it is rushing forward all the cars possible, and will soon have as large a stock as ever, and better assorted, as the old stock had run short on a few sizes. The insurance will cover about half the cost of the poles.

THE telephone department of the Western Electrical Supply Company, of St. Louis, has just issued a number of bulletins covering its new telephones, switchboards, etc. These are bound up in catalog form, and embrace everything pertaining to the complete equipment, construction, and maintenance of a telephone line or exchange. They contain a large number of absolutely new devices for the economical operation of lines and exchanges, which have never been shown before. The improvements in the telephone and switchboard devices in the last year have been something phenomenal. So great, indeed, are they, that one can hardly realize the large number of economical and labor-saving devices that have been gotten out until he glances through a new, up-to-date catalog such as the Western's. Among the new things noted by the writer were their loud-ringing extension gongs, developed in response to a demand for an extension bell to be used on telephone lines in noisy places; its adjustable arm, long-distance transmitter, with solid back. Its new Ideal bridging telephone embodies a number of new features, making it, it claims, the highest-grade long-distance telephone ever produced. It also shows a very attractive-looking receiver with a covered diaphragm, which appears to be quite an improvement over the old style. Anyone contemplating installing a new exchange, or making additions and improvements of any kind, would do well to obtain a copy of these bulletins. They are mailed on application.

The Smith & Hemenway Company and the Utica Drop Forge & Tool Com-

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pany, 296 Broadway, New York, are offering as their latest novelties in plyers a side-cutting long-nose plyer. The advantages claimed for this plyer are, that having a long, narrow nose, it will be of use in deep, narrow quarters in which an ordinary tool will not work, and also will do the work of a regular tool. It is convenient to carry, every tool is carefully tested at the factory before sending out. Can be used by telephone manufacturers, machinists, engineers, electricians and jewelers.

The No. 118 plyer illustrated below is a plyer having the handles insulated with rubber, which protects the user thereof from receiving an electrical shock. Having round edges, it can be carried in the pockets without injury to the clothing. It is used a great deal by linemen and electricians, and has given satisfaction to every one.

The next illustration is a No. 655 plyer, which is made of the finest Brescian steel. A great advantage to users of this plyer, especially engineers or electricians, is that it can be used in close quarters and still be used as a side-cutting plyer. Engineers can lace their belts and at the same time cut the lacing off, favorite among electricians for use on a telephone, dynamo, or switchboard work. Its round bearings have made it a great favorite over tools having box joints.

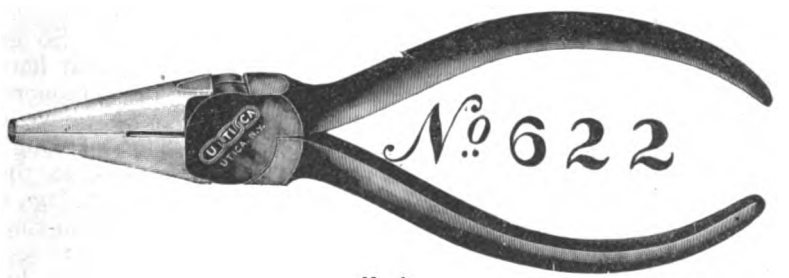
A very handy and useful book, known as "The Green Book of Hardware Specialties," is published by this enterprising firm. Write for one, as they are sent free on application.

ADRIAN, MICH., May 14, 1901.

TELEPHONE MAGAZINE, *Chicago, Ill.:*

GENTLEMEN,— The American Electric Fuse Company, of New York, Chicago, and San Francisco, begs to call the attention of the magazine to the fact that its factory has been removed to Adrian, Michigan, where large and better facilities for turning out work are afforded.

The company is now employing over one hundred people, and a demand for



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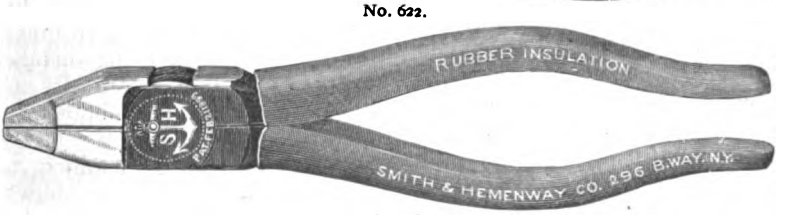

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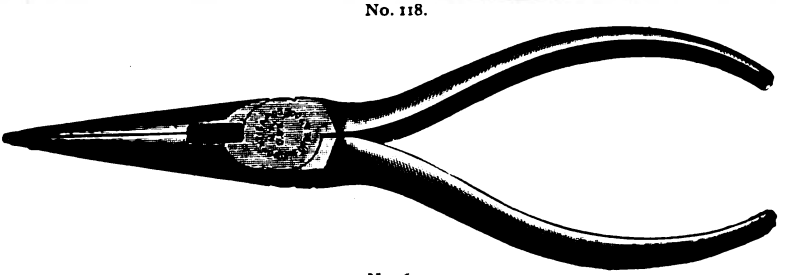

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its goods has been so unprecedented that the company has been for some time considerably behind on its orders. The great difficulty of securing porcelain in the large quantities required by the company has compelled it to lose several orders by reason of its inability to fill. The company has, however, just made new arrangements, which are more than double its former capacity for supplying porcelain, and has now on hand a large stock of its standard sizes. There will, therefore, be no further delay in filling orders on this score.

The company has recently closed contracts with several of the largest telephone companies of the United States for the furnishing of its standard lines of protectors, connectors, fuses, etc., showing the high opinion of the trade for its lines of goods.

The company is also doing a very large jobbing trade, as wholesalers, throughout the country, and jobbers have found it an advantage to them to carry a complete stock of the Fuse Company's goods always on hand to supply the constant demand for them.

The American Electric Fuse Company expects very soon to place on the market an entire new line of illustrations and printed matter, which will appear in about one month. This line is a distinct novelty and it will pay any manufacturer, jobber, or consumer to write the Fuse Company for further particulars before placing their orders elsewhere.

We will be obliged to you if you will kindly insert the foregoing, or the substance thereof, in an early issue of your valued paper.

Thanking you for many past favors, and awaiting your early reply, we remain, Very respectfully,

AMERICAN ELECTRIC FUSE CO.,
Per *Frank N. Jones.*

THE Eureka Electric Company, Chicago, announces that it has had for some time Eastern offices located at 578-580 Ellicott Square, Buffalo, N. Y., where it has displayed complete samples of its entire product. It is the desire of the Eureka Company to have all telephone exchange representatives make their headquarters at these offices during the National Telephone Convention, June 11, 12, 13. Also during the Pan-American Exposition, or at any time when in Buffalo, as they are permanent offices. Besides making a very elaborate exhibit in its salesrooms and offices the Eureka Company will also have complete exhibit in the Electrical building, Pan-American Exposition. The managers, Messrs. Pratt and Woodford, will be pleased to extend any courtesies in their power.

All Official Communications to this Office should be addressed
"CHIEF SIGNAL OFFICER,
U. S. Army, Washington, D. C."

WAR DEPARTMENT,
SIGNAL OFFICE,
WASHINGTON, February 26, 1901.

Ericsson Telephone Co., 296 Broadway, New York:

DEAR SIRS,— Referring to the order this day placed with you for 200 bridging telephones, this office desires to state that, as you are probably aware, in the early part of 1900, we shipped a lot of telephones of six different makes to Manila, for test purposes. The report upon the Ericsson telephone has been favorable. As the telephones covered by the present order are going to Manila, you should understand that it is expected that they will be in every respect of the very highest class of workmanship, in every detail, and it is believed that your company will readily see that it is to your own advantage to turn out the very best instrument possible. The telephones when ready will be subjected to a very careful and thoro inspection.

By direction of the Chief Signal Officer.

Very respectfully,
EUGENE O. TECHET,
Captain and Signal Officer, U. S. V.,
Disbursing Officer.

"I find you magazine to be highly instructive. It ought to be in the possession of every one in our business; to merely read it is not sufficient."

W. ALLEN.

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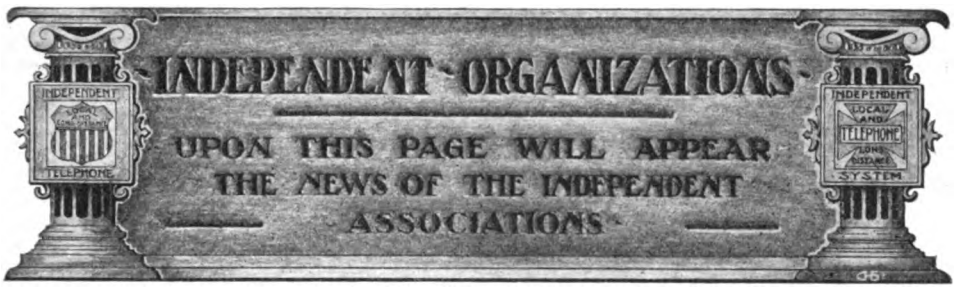

THE NATIONAL INDEPENDENT TELEPHONE ASSOCIATION.

The National Independent Telephone Association of the United States will convene at Buffalo, New York, United States of America, on June 11, 1901, at the Pan-American Exposition grounds. The program of the meeting is announced on the first page of this issue.

We have made arrangements with the Wabash Railroad for a special rate of $13 for the round trip between Chicago and Buffalo, good on any train and limited to ten days from the day the ticket is purchased. Every one interested in the telephone business that has the time and the price should go, as a matter of telephonic education, if for nothing else.

The general committee is composed of Samuel E. Weyland, Scranton, Pennsylvania, together with Robert R. Hefford and Clark L. Ingham, of Buffalo; these gentlemen will secure special rates at all hotels for those attending the convention. It would be advisable for intending visitors to notify this committee in advance so that the necessary accommodation can be reserved. In choosing Buffalo as the convention city during the exposition the association has been wise in its selection, as the city of Buffalo will at this time afford numerous attractions for the visitors, together with the fact that a number of the leading telephone manufacturers have exhibits at the exposition. Telephone dealers will have an opportunity to display their product to the members of the association better than ever, for when the convention has been held in the different cities it only permitted a limited display of apparatus, and then again, the manufacturers could not afford to fit up a very elaborate display for a few days. The exposition being open during a period of seven months, warrants the manufacturer in making a complete display, which should be of unusual interest to the members of the association.

SUMMER MEETING OF THE INDEPENDENT TELEPHONE ASSOCIATION OF WISCONSIN AT LACROSSE, JUNE 25 AND 26.

The Independent Telephone Association of Wisconsin will hold its summer meeting at La Crosse on the 25th and 26th of June. This is the fourth meeting of the association and it is planned to make it specially interesting. Most of the important telephone manufacturing and supply houses of the Northwest will be represented at this meeting and with exhibits of their apparatus.

The telephone business of Wisconsin is unusually active this year, and this season will witness more construction than any heretofore. There are now some one hundred and fifty independent telephone companies in the State and since the first of January this year over twenty new companies have been organized.

THE NORTHWESTERN INDIANA TELEPHONE ASSOCIATION.

The representatives of the independent telephone companies of the Tenth Congressional District of Indiana held their meeting at Lafayette.

The object of the gathering was for the purpose of considering the betterment of the telephone service and matters of construction. Before the meeting adjourned the members organized a permanent organization, to

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be known as the Northwestern Indiana Telephone Association. Its object is to place the managers of the various independent companies in a position where they will be brought more closely together and to promote harmony among the independent lines, of which there are a great many in that State.

A State meeting of the independent telephone representatives will be held in Lafayette some time in July, and the Northwestern Indiana Association will meet there at the same time.

IMPORTANT DECISION.

The Circuit Court at Wellsville, Ohio, has just handed down a decision in the case of Hays vs. The Columbiana County Telephone Company, that is of more than ordinary importance. It held that the dedication of a street contemplated its use for the purpose of sending messages either by the methods in use at the time of the dedication, or by such methods as might afterward come into use.

It held that the telephone is a new method of sending messages, and hence is within the dedication, and is not an additional burden on adjoining landowners. The court also held that the construction of a telephone on Lunday street in Salem did not materially interfere with the easement of the plaintiff in the above.

A NEW CAUSE FOR SUIT.

A case interesting from the fact that it brings to trial a question never tried in court, that of the liability of a telephone company in delivering messages transmitted to them, is before the district court of Mason City, Iowa.

Hans Nelson is suing the Greene & Western Telephone Company for $2,000 for failure to deliver a message calling a physician. Nelson's child had diphtheria and died, he claims, thru lack of medical care caused by the negligence of the company in delivering the message. In his bill he sues for the sum of $2,000, naming in his claims the loss of the child's time until its majority, the sufferings from mental anguish, and smaller claims.

HYPNOTIZED OVER 'PHONE.

Hypnotizing a subject by telephone was successfully performed at Rochester, New York, by Clayton Wilcox, of Mexico, assisted by Ruben Punnett, a local hypnotist. The exhibition took place at the Rochester Whist Club before an audience composed largely of members of the Rochester Pathological Society. Professor Wilcox took his post at the telephone in a newspaper office and at his command to sleep the subject at the telephone in the clubhouse let the receiver fall and dropped to the floor in a sound sleep, from which all the physicians present could not awaken him. He withstood every test and was only brought t when again placed in communication with Wilcox at the 'phone.

THE GLASGOW EXCHANGE.

An important step in the popularization of the telephone has just been made in Glasgow, the first municipality in the country to set up a telephone exchange which will come into active competition with the National Telephone Company. The Corporation system has been opened, and at an early date 4,800 subscribers will be enabled to use municipal telephones in the commercial capital of Scotland. The Glasgow Corporation telephone area covers 143 square miles, the lines extending to all districts surrounding the city. Accommodation in the central exchange has been provided for no fewer than 12,000 subscribers, and suburban exchanges will be established in due course. The system is notable in another respect than that of being a municipal one. It is an underground system, the conduits all running under the streets, and the wires are insulated with paper, a method which has the advantage of enabling a large number to be compressed into a small space.

BROCKPORT, N. Y., Dec. 24, 1900.

GENTS,— I enclose $1 for renewal of TELEPHONE MAGAZINE another year. I am very much pleased with your magazine and have found lots of help in it. It is the best in its line I have yet seen.

Yours truly,

F. A. WINNE.

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TELEPHONE NEWS.

ARKANSAS.

ASHDOWN, ARK.— Articles were filed incorporating the Interstate Telephone and Telegraph Company of Ashdown, with a capital stock of $50,000. The incorporators are William M. Freeman and Frank A. Locke, Ashdown; Lawrence A. Byrne, Texarkana.

NEWPORT, ARK.— The Jackson County Telephone Company of Newport was incorporated with a capital stock of $2,000, of which $750 has been subscribed. The officers are John W. Ferrell, president; R. K. Fitzhugh, vice-president; B. B. Bond, secretary and treasurer. The company proposes to build a telephone line from Newport to Tupelo, in Jackson county, and from Tupelo to Fitzhugh, in Woodruff county.

WALNUT HILL, ARK.— Chartered: Walnut Hill Telephone Company, capital stock $2,500, with J. F. McKnight, president; S. Hacker, vice-president; D. D. Hamiter, secretary and treasurer. The company has let contract for construction of system from Walnut Hill to New Lewisville.

WAXAHACHIE, TEX.—The Commissioners' Court granted to the Ellis County Telephone Company, a local organization, a franchise over the public roads of the county from Waxahatchie to Roy, Howard, Nash, Maloney, Avalon Boz, Eyrie, Ozro and Auburn, all in this county.

CALIFORNIA.

BERKELEY, CAL.— Century Telephone Device Company. To deal in telephone patents, etc. Principal place of business, Berkeley. Directors, J. W. Bolster, W. D. Watkins, San Jose; G. Davies, E. L. Corzella, Berkeley; R. A. Berry, Fresno. Capital stock, $100,000; subscribed, $600.

SAN FRANCISCO, CAL.— The Christian Cooperative Telephone Association, which operates lines in and around Sunnyside, Washington, has decided to double the capacity of its equipment this season. The Pacific States Telephone & Telegraph Company will soon extend its lines to Sunnyside and compete with the Christians.

CAROLINAS.

ARAPAHOE, N. C.— Reel & Rawks expect to build a telephone line to Reelsboro, eleven miles, and probably on to Newton, twenty miles.

CHARLOTTE, N. C.— The Charlotte (N. C.) Telephone Company, the old "Queen City Company," recently purchased by the Curtis Syndicate, of New York, has been chartered with $30.000 capital stock. J. B. Curtis, of New York; J. I. Taylor and A. A. Miller, of Charlotte, are the incorporators.

FAYETTEVILLE, N. C.— Franchises have been granted the Fayette Telephone Company and the American Telephone & Telegraph Company for construction of systems.

HENDERSON, N. C.— The Henderson Telephone Company has increased its capital stock to $100,000, and will this coming summer build a number of new exchanges and toll lines. The Carolina & Virginia Telephone Company will build about two hundred miles of copper-wire toll line to connect its different exchanges and those of the Henderson Company.

LATTIMORE, N. C.— The Lattimore Telephone Company has been incorporated, with capital stock of $1,350, by S. S. Royster, D. B. McBrayer, of Mooresboro, and J. H. Johnson of Lattimore.

GOURDIN'S, S. C.— A commission has been issued for the charter of the Gourdin's Telephone Company. The purpose of the corporation is to connect by telephone the towns of Gourdin's, Greeleyville and Georgetown. The capital stock of the company is to be $1,000. The corporators named are S. A. Graham, J. C. Graham and W. D. McClary.

CONNECTICUT.

ANSONIA, CONN.— The Southern New England Telephone Company has recently absorbed the Ansonia (Conn.) Telephone Company, the details having been completed a few days ago. President M. F. Tyler, of the Southern company, stated that the absorption was in the nature of a friendly sale, and added that his company would carry out all the contracts of the Ansonia corporation so far as might be possible, and would continue the business as previously.

WATERBURY, CONN.— The stockholders of the Automatic Telephone Company at a meeting held last night voted not to withdraw from the field. This action is taken despite the rejection of the company's petition by the committee on incorporations, and the decision of the Supreme Court that put the New London company out of business. The belief is that favorable public opinion will result in the necessary support for a competitor with the Southern New England Company.

DAKOTAS.

ABERDEEN, S. D.— Manager Zeitlon, of the Dakota Central Telephone Company, has returned from the East, where he arranged for the purchase of large quantities of wire, poles and other supplies for the extension of the system. Copper wire for a new metallic circuit between Aberdeen and the twin cities will soon arrive and the line will be completed as soon as possible. It is possible a branch line from this circuit may be run into Watertown. New exchanges will be put in at Britton, Wilmot and Bryant.

BERESFORD, S. D.— The A. B. and E. Tele-

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phone Company at Beresford, with a capital stock of $2,000. Incorporators, Matthew Traynor, Peter Loss and C. B. Thompson.

CLEAR LAKE, S. D.—The Citizens' Electric Light & Telephone Company has been granted a franchise at Clear Lake, S. D.

CANTON, S. D.—The Canton Coöperative Telephone Company, of Canton, S. D., declared a dividend of 12 per cent at its recent annual meeting. The company contemplates building a toll line to Moe, twelve miles south.

FORMAN, N. D.—The Forman Telephone Company will build a toll line from Forman to Havana, North Dakota, in July.

HURLEY, S. D.—J. A. Steninger will establish a local exchange at Hurley, South Dakota.

JAMESTOWN, N. D.—E. Allen secured a franchise at Jamestown, North Dakota, for a local exchange. M. H. Jewell's request for a franchise was refused.

LANGDON, N. D.—The Northwestern Telephone Exchange Company will extend its line from Langdon, North Dakota, to Hannah.

PIERRE, S. D.—Federal Wireless Telephone & Telegraph Company, Pierre; capital stock, $5,000,000; incorporators, Alfred B. Davis, Seymour Lee, and W. A. J. Seals.

PIERRE, S. D.—Articles of incorporation have been filed for the Universal Wireless Telegraph Company, with a capital stock of $20,000,000. The incorporators are James N. Huston, Thomas E. Bishop and L. C. Smith.

VERMILLION, S. D.—As a result of the franchise granted the Northwestern Telephone Company by the Vermillion (S. D.) city council Superintendent Christy has ordered numerous improvements to be made. All old 'phones will be replaced by new ones, two new switchboards, one for toll and the other for local exchange, will be added. Twelve hundred feet of new cable has reached Vermillion, and the work of remodeling has started. Over one hundred 'phones are now in use in Vermillion.

WOONSOCKET, S. D.—The Woonsocket Telephone Company has been granted a franchise for a local exchange at Woonsocket, South Dakota.

FLORIDA.

BARTOW, FLA.—Southern Bell Telephone Company (offices at Atlanta, Ga.) and Peninsular Telephone Company (represented by Wilson & Boswell) have each applied for telephone franchise.

BRAIDENTOWN, FLA.—The Peninsular Telephone Company is now in full possession of the Telephone lines at Braidentown, Palmetto, and Manatee. These the company will connect with its Tampa line, and greatly improve the entire system. At Tampa the company has placed the price of business telephones at $2.75 a month and residence telephones at $1.50. Several hundred subscribers have already been secured. It is the intention of this company to erect systems in Lakeland, Bartow, Fort Mead, Plant City, Fort Myers, Arcadia and Palmetto at once, and they will all be connected.

GAINESVILLE, FLA.—Perry M. Colson will organize a stock company to build a telephone line from Gainesville, Florida, to Montbrook, Cedar Keys and other points.

PENSACOLA, FLA.—Franchise to construct telephone system has been given to the Southern Bell Telephone Company.

GEORGIA.

CARROLLTON, GA.—Lewis K. Smith, manager of the Gainesboro long-distance telephone system, with headquarters here, has just completed connection with Tallapoosa, twenty miles northwest, and has gotten a line through to Buchanan, the county seat of Haralson, twenty miles north.

GAINESVILLE, GA.—Mr. John Oliver, owner and operator of the Gainesville local telephone lines, will begin the erection of a system of telephone lines that will connect Gainesville with Murphy (N. C.), Toccoa, Cornelia, Demorest, Clarkesville, Tallulah Falls, Nacoochee Valley, Hiawassee and Cleveland.

SAVANNAH, GA.—The Georgia Telephone & Telegraph Company of Savannah has issued a new list of stations, which shows that the company has added four hundred subscribers to its list since last October. These additions give the company now slightly over 1,200 subscribers, and others are being added daily—in fact, so great is the demand for 'phones that the company will be forced to add a new cable capable of accommodating 200 instruments. To promote the use of residence instruments, the company has made a rate of $65 a year to cover the installation of both a residence and a business telephone.

WINDER, GA.—A $6,000 stock company has been formed in Winder, Georgia, by Judge Russell, M. D. Irwin and T. C. Dunn, to establish a local telephone exchange. As soon as the work is completed a line will be run from Winder to Athens and Atlanta.

ILLINOIS.

AVON, ILL.—Avon Mutual Telephone Company, Avon; capital stock, $1,500; operate a telephone system; incorporators, George A. McFarland, A. Sundberg, G. S. Osborn.

BRIAR BLUFF, ILL.—The Briar Bluff Telephone Company met to transact business and elect officers for the coming year. J. F. Kincaid was elected president; J. F. Delany, secretary; Martin Coleman, treasurer.

BELVIDERE, ILL.—The Belvidere Telephone Company has increased its capital stock from $25,000 to $50,000.

BRADFORD, ILL.—The Milo & Bradford Telephone Company has been incorporated; capital stock, $5,000. Incorporators, John McClane, Leroy H. Reed and Harmon S. Pettigrew.

BENTON, ILL.—R. A. Youngblood has sold his interest in the Youngblood-Stamper Telephone Company and Captain C. Moore, W.

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W. McCreery, A. S. Cleveland, E. Fitzgerrell, J. T. Chenault and others have bought an interest. The company has just placed an order for two carloads of cedar poles and one carload of cross-arms, and hereafter all lines will be constructed with cedar poles and the best material. An exchange will soon be put in at Ewing and West Frankfort, and several lines of new toll wire will be built.

CHICAGO, ILL. — Telephone Auxiliaries Company, Chicago; capital stock, $10,000; manufacturing telephones and electrical devices; incorporators, H. P. Young, Nathan S. Smyser, E. J. Wilber.

CHICAGO, ILL.— International Telephone Manufacturing Company, Chicago; capital stock, $100,000; manufacturing electrical devices; incorporators, W. E. McCormick, J. F. Dunlap, George H. Dunlap.

CHICAGO, ILL.— The Independent Telephone Construction Company, Chicago; capital stock, $2,500; incorporators, James P. Harrold, W. E. Caylor and others.

CHICAGO, ILL.—The International Telephone Manufacturing Company has been incorporated here; capital stock, $100,000; incorporators, William E. McCormick, J. F. Dunlap and George H. Dunlap.

CHICAGO, ILL.— Monarch Telephone Company, Chicago; capital stock, $10,000; manufacturing and telephone business; incorporators, J. E. Norling, Ernest E. Yaxley, Ward B. Sawyer.

CHICAGO, ILL.— McFell Electric and Telephone Company, Chicago; capital stock, $2,500; electrical construction and installing; incorporators, Judson McFell, Nellie McFell, Christopher Buckles.

CHICAGO, ILL.— The Advance Electric & Telephone Company, Chicago, has been incorporated; capital stock, $15,000: incorporators, V. Horace Messenger, H. Henry Hansen and George A. Thompson.

CHILLICOTHE, ILL.— The Peoples Telephone Company, Chillicothe, Illinois, has been incorporated, with a capital stock of $4,000. B. F. Zinzer, Howard L. Pettet and W. D. Kelley are the incorporators.

CORINTH, ILL.— Crab Orchard Telephone Company, Corinth; capital stock, $2,000; operate telephone system; incorporators, G. O. Mitchell, J. L. Dorris and J. L. Roberts.

COLONA, ILL.—At its recent meeting the Peoples Telephone Company elected officers and chose F. S. Fenno and Henry Hohenboken managers, to put their lines in good order. This is the pioneer Colona company, and owns what are called the Colona and Briar Bluff lines.

CARLYLE, ILL.— Col. J. H. Allen, of St. Louis, has been granted permission by the Bond county supervisors to construct a telephone line in that county. He intends to connect by telephone the towns of Greenville, Smithboro, Woburn, Mulberry Grove, Pleasant Mound, Hookdale, Tamalco, Keysport, Beaver Creek, Dudleyville and other places.

EAST ST. LOUIS, ILL.— The Kinloch Telephone Company is increasing the number of its subscribers in Venice, Granite City and Madison, Illinois. Fifty new stations have been installed in the past month. Miss Stella Baughan is representing the company, and is probably the only woman in Illinois to whom is intrusted the work of superintending telephone construction. She is in charge of the Madison central office.

CHARLESTON, ILL.— A meeting of the two sections of the Farmers' Mutual Telephone Line, running from Ashmore to Charleston, was held. Division one elected the following officers: Dr. F. M. Leitch, president; P. A. Timmons, secretary; William McDevitt, treasurer. Division two elected T. T. Shoot, president; John Snyder, secretary; I. B. Mitchell, treasurer. A chairman of each board of directors is a member of the legislative body of the Farmers Mutual Telephone Company.

DOVER, ILL.— Aaron Dunbar, Dr. Blackburn, James Sabin, C. V. Field, Alfred Norris and E. Anderson were elected trustees for the east side of the county at the annual meeting of the Bureau County Independent Telephone Company. The others members of the board are, C. O. White, Dr. Owens, J. W. Ross, C. B. Keigwin and P. P. Michael.

FARINA, ILL.— The Farina & Vandalia Telephone Company, of Farina, Illinois, has increased its capital stock from $2,500 to $5,000.

FARMER CITY, ILL.— B. F. Wasson, superintendent of the Farm and City Telephone Company, at Farmer City, is arranging to increase the capital stock of his company $10,000. His company has purchased the Graham line and exchange at Waynesville. Arrangements are also being made to construct a metallic circuit between Clinton and Farmer City and establish a station at Birkbeck. The system now has orders for telephones from 550 farmers along its lines.

IUKA, ILL.— The Daniels Telephone Company, of Iuka, Illinois, has been incorporated, with a capital stock of $10,000. The incorporators are George E. Daniels, Porter E. Daniels and Jordan W. Harrison.

MILO, ILL.— Milo & Bradford Telephone Company, Milo; capital stock, $5,000; operate telephone system; incorporators, John McClane, Leroy H. Reed, Harmon S. Pettigrew.

MANNON, ILL.— The String-Town Telephone Company held its annual election at Mannon and elected I. N. Shields, president; Bert Willits, secretary.

MATTOON, ILL.— The Coles County Telephone Company, with headquarters in this city, has arranged to establish a telephone exchange at Toledo, the county seat of Cumberland county, and the plant will be installed within the next few weeks.

POLO, ILL.— The Ogle County Telephone Company was incorporated under the laws of the State, with a capital stock of $20,000. The company will do business in the western part of Ogle county, with headquarters at Polo. Among the stockholders are Alexan-

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der Anderson and Horatio Wales, of Polo; B. W. McHenry, A. B. Sheadle, David Klein and Willard Graham of this city. Mr. Wayles will probably be elected president and B. W. McHenry secretary and general manager.

PORT BYRON, ILL.—A telephone company has been organized in Port Byron, with a view to building a line to the Union switchboard, when it is located. A. F. Hollisler was chosen president, Frank Garnet secretary, and A. H. Wendt treasurer. They will have charge of the work.

PRINCETON, ILL.—The first meeting of the stockholders of the Bureau County Independent Telephone Company since it was organized by the consolidation of various local companies, was held at the company's office in Princeton. Dr. A. E. Owens, of Princeton, was elected president, and Aaron Dunbar, of Dover, vice-president; C. O. White, of Princeton, secretary and general manager, and A. H. Ferris, of Princeton, treasurer. The former directors were elected, with the exception of W. L. Isaac, of Malden; W. S. Wilson, of Ohio, and I. H. Heater, of Green Oak, in whose places the following were elected: E. Anderson of Marquette, Fred Norris of LaMoile and Aaron Dunbar of Dover.

PLEASANT RIDGE, ILL.—The citizens of Pleasant Ridge and vicinity are building a telephone line from Lagrange locks to Lagrange, to connect with Cooperstown line. They appointed as managers John Hemphill, Charles Petri and Charles Sellars; the line to be built as soon as possible.

PEARL CITY, ILL.—Granted: Dr. W. E. Clay, his associates and assigns, the right to erect, maintain and operate a system of telephone lines and fixtures in the streets of the town of Pearl City, Illinois. Granted to the Stephenson County Independent Telephone Exchange Company the privilege of erecting and maintaining poles and fixtures in the streets and alleys in said town of Pearl City.

QUINCY, ILL.—The Hancock County Telephone Company was granted articles of incorporation. The line will extend from Augusta to Carthage, via Providence and Mt. Pleasant neighborhoods. There will also be a line from Denver to Plymouth. The incorporators are J. A. Clark, T. A. Burner, William Walton, F. E. Hug, M. E. Randall, E. Walton and D. Lane.

STANFORD, ILL.—For some time Stanford has had two telephone companies, but recently Dr. William Patch bought out the C. Roth Company and now has consolidated them. The old Patch company had 150 'phones, and the Roth company had 96.

STRONGHURST, ILL.—The Henderson County Telephone Company is enjoying an excellent growth. It has recently installed thirteen telephones in Oquawka and a like number in Stronghurst. Business is increasing so rapidly that it will be necessary to construct a number of new country lines. The company expects to put up full copper metallic toll lines in the near future to replace the grounded circuits now in use. The company's lines now cover two hundred miles of territory in Henderson and adjoining counties in Illinois. Mr. H. E. Scovern is general manager.

SULLIVAN, ILL.—The Sullivan Telephone Exchange has been incorporated into a stock company of the same title, with a capital stock of $10,000, all of which has been subscribed. The board of directors met and selected John R. Pogue, president; James L. Kirk, vice-president; A. O. Harrison, secretary, and Dr. A. D. Miller, treasurer.

WESTON, ILL.—The new Farmers' Telephone Company was organized. They are to establish a central in Weston. Officers elected were: O. O. Dillon, president; A. B. Corrithers, secretary; F. L. Crocker, treasurer. The name of the company will be the Weston Union Telephone Company.

YATES CITY, ILL.—Ideal Telephone Exchange, Yates City; object, to operate a telephone system; capital stock, $2,000; incorporators, W. G. Lehmann, O. B. West, M. W. Thomson.

INDIANA.

BROOKVILLE, IND.—The Brookville Telephone Company held its annual meeting. The directors elected John C. Shirk president, A. L. Baughman secretary, and Charles F. Jones treasurer.

BUTLER, IND.—The Butler Telephone Company, of Butler, Indiana, filed letters increasing the capital stock from $10,000 to $25,000. This company seems to be prospering, and suggests that Waterloo business men, had they not been too timid, might have been making money in telephone stock. The opportunity was once before them.

BRAZIL, IND.—At the meeting of the city council the new Brazil Telephone Company, in which Terre Haute people and capital are interested, petitioned for a franchise.

CHARLOTTESVILLE, IND.—The Charlottesville Rural Telephone Company, of Hancock county, Indiana. (capital stock, $2,000), was incorporated. The company will operate rural telephone lines, with headquarters at Charlottesville. Directors, Robert S. N. Oldham, Daniel Pearson, David Bundy, James McClarnon and Winfield S. Lane.

COLUMBUS, IND.—The Citizens' Telephone Company, of Columbus, Indiana, has just finished the installation of about twelve thousand feet of aerial cable. The Coöperative Telephone Construction Company of Chicago did the work. The Citizens' company has now one of the best cable systems in the State of Indiana.

DANA, IND.—The Citizens' Telephone Company has been granted a franchise to establish a plant at Dana, Indiana.

EMPORIA, IND.—Articles of incorporation were filed with the Secretary of State by the Emporia & Anderson Telephone Company. The company will construct and operate a telephone system, with headquarters at Emporia, in Madison county. The direct-

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ors are, Samuel Mitchell, M. M. Gustion, John Summerville, V. P. Gale and Daniel Rector.

HARFORD, IND.—The following have been elected by the Harford Telephone Company: S. H. Browne, president; Stanley Baker, secretary and treasurer; Robert C. Richardson, manager.

INDIANAPOLIS, IND.—A chess tournament is being conducted in this city by telephone. There is an "uptown" and a "downtown" club, each maintaining three tables, presided over by a conductor, who receives and announces the moves made by the respective players.

JASPER, IND.—The Dubois County Telephone Company, which has been working in this vicinity for some weeks, opened its exchange in this place to the public, and all subscribers have free service to Tell City, Cannelton, Troy, St. Meinrad, Gentryville, Dale, Leavenworth, Corydon, Marengo and all towns along the Air-Line east to New Albany, Salem, Paoli, West Baden, French Lick, Winslow, Petersburg, Washington and a score of other towns.

LETT'S CORNER, IND.—The Lett's Corner Telephone Company; capital stock, $675. The board of directors will be elected at the annual meeting of the stockholders.

LAPORTE, IND.—The Laporte Telephone Company has increased its capital stock to $30,000.

NORTH MANCHESTER, IND.—Dayton Harter, cashier of the Bank of North Manchester, and Lewis Signs, ex-postmaster at North Manchester, have obtained from the Wabash County Commissioners a franchise covering the highways of the entire county for telephone toll lines. They are interested in an exchange at North Manchester, and it is believed it is intended to make it a nucleus for an extensive county system.

REDKEY, IND.—An independent telephone company is being organized at Redkey, Indiana. The stockholders, business men of the town, have subscribed $2,500 in $25 shares. The purpose is to connect with independent exchanges in other towns, and help fight the Central Union.

ROCHESTER, IND.—The Rochester, Indiana, Telephone Company has purchased the telegraph line along the Cudahy oil pipe line from Roann to San Pierre, a distance of seventy-one miles. The company will at once rebuild the line and open stations at Disko, Gilead, Delong, Monterey, Bass Lake, North Judson and San Pierre. At Roann connection will be had with the independent long-distance telephone service of Indiana, Ohio and other States. It will also connect with the local telephone systems at Kewanna, Plymouth, Akron, Winamac, North Judson and Knox.

RUSHVILLE, IND.—At the meeting held by the directors of the Coöperative Telephone Company the following officers were elected; President, T. M. Green; vice-president, Ben L. McFarlan; treasurer, Howard E. Barrett; secretary and manager, Z. E. Mauzy.

SPENCER, IND.—Three telephone companies are competing for business in this city. The Spencer Telephone Company has long-distance connections with the Central Union, the Citizens' Company is connected with the New Company of Indianapolis, and the Farmers' Coöperative Company has an exchange. Each of the local companies has about 100 subscribers, and there are 600 telephones in the county connected with them.

THORNTOWN, IND.—Articles of incorporation were filed for The Thorntown Coöperative Telephone Company; capital stock, $500.

TERRE HAUTE, IND.—The Retail Merchants' Association decided to use only the telephones of the new local company, and to take out the telephones of the Bell Company, on the ground that "the lowering of rates is directly due to the advent of the Citizens' Company."

VALPARAISO, IND.—James H. McGill, of Valparaiso, Indiana, is interested in a telephone line between La Crosse and Valparaiso, with connections to La Porte.

WESTFIELD, IND.—A new telephone company was organized here, to be known as the White Star Telephone Company, with $10,000 capital. Directors: Ellis Barker, M. E. Cox, W. W. Mendenhall, Dr. N. E. Harold, and Ellis Kobirts.

WARSAW, IND.—The Commercial Telephone Company, of Warsaw, Indiana, announces that if a sufficient number of subscribers can be obtained it will extend its lines throughout the country and give to the farmers the same service as is given to the city people. The lines will be connected with the city system and the rental rate will be the same as that in Warsaw.

IOWA.

ADAIR, IOWA.—Articles of incorporation were filed by the Adair Telephone Company; capital stock, $10,000. L. H. Paine, W. H. Archer, S. B. Givin, O. H. Archer, G. W. Cox, Guy Patten, R. T. Rowland and E. D. Correll are the incorporators.

ATLANTIC, IOWA.—Musson Brothers, of Atlantic, Iowa, have bought the Atlantic, Mount Etna and Corning Telephone Company's lines between Massena and Atlantic.

AFTON, IOWA.—The Afton Mutual Telephone Company, of Afton, Iowa, will install a local exchange at once.

BERESFORD, IOWA.—A. B. and E. Telephone Company, Beresford; capital, $2,000; incorporators, Matthew Traynor, Peter Loss and C. B. Thompson.

BRITT, IOWA.—The Western Electric Telephone Company has just come into possession of the Greene & Western Company's system, including 450 miles of toll line and exchanges at Mason City, Charles City and Osage, Iowa. This is said to be a $100,000 deal. The outside limits of the Greene & Western Company's lines are as follows: Lyle, Minnesota; Clear Lake, Belmond, Hampton, Greene, Charles City and Osage, Iowa; making a complete wiring of the following counties: Worth, Cerro Gordo,

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Franklin, Wright, Butler, Floyd and Mitchell. With the purchase of the Greene & Western system the Western Electric Company now reaches every town in the northwest twenty-six counties of Iowa, with exchanges at several of the more important points. Three hundred miles of toll line will be built in Minnesota and South Dakota during the present season.

BETHESDA, IOWA.— Bethesda, Iowa, though one of the smallest towns in the county, has five different telephone lines connecting there, representing a total of over a hundred telephones.

CEDAR, IOWA.— The Union Telephone Company, of Cedar, has filed articles with the Secretary of State. Its capital stock is $10,000. The incorporators of the company are: C. Bradley, William Abegg, R. E. Holloway, J. W. Garvin, James L. Moore, A. J. Fairchild, Moses Picken, R. J. Woody, C. W. Moore.

CALAMUS, IOWA.— The Farmers and Business Men's Mutual Telephone Company of Clinton County is the name of the new telephone line.

CARTHAGE, IOWA.— The Hancock County Telephone Company was granted articles of incorporation. The line will extend from Augusta to Carthage via Providence and Mt. Pleasant neighborhoods. There will be also a line from Denver to Plymouth. The incorporators are: J. A. Clark, T. A. Burner, William Walton, F. M. Huff, M. E. Randall, E. Walton and L. D. Lane.

CHARLES CITY, IOWA.— The telephone line here and at Mason City has been sold by Kine McAllister to Webster, Way & Carter, of Mason City.

CENTERVILLE, IOWA.— The annual meeting of the Centerville Telephone Company resulted in the election of the following officers for the ensuing year: President, D. C. Bradley; vice-president, C. M. Crego; secretary and treasurer, C. A. Farrington.

CLEMONS, IOWA.— The East Liberty Telephone Company with headquarters at this place, opened their three lines with thirty-three 'phones. The lines extend from Clemons out into eastern Liberty and western Bangor townships, and more 'phones will be added soon.

CHEROKEE, IOWA.— A franchise was granted to the Western Electric Telephone Company, the proposition carrying by one vote.

CEDAR RAPIDS, IOWA.— The Cedar Rapids & Marion Telephone Company announces 154 new toll conections recently made over the line of the Johnson County Telephone Company. The stations are located in eastern Iowa and western Illinois.

DES MOINES, IOWA.— The sale of the property of the Central Telephone Company of this city to I. S. Mahan, of LaPorte, Iowa, and G. W. Brown, of Belle Plaine, was consummated yesterday. Possession will be given May 15. The transfer includes 175 miles of copper metallic circuit toll lines extending out of Des Moines to Oskaloosa, Baxter, Newton and Story City and two exchanges, one of sixty-five instruments in Colfax, and the other of twenty-six instruments, in Pella. Messrs. Martin and Brown, the purchasers, have secured a franchise for an exchange to be built in Newton, which will commence business about May 15, with about 100 instruments. The purchase of the Central property was made with the idea that it will give the Newton concern control of the independent telephone business of Jasper county. The Central property is owned by Messrs. M. McFarlin, H. E. Teachout, H. C. Hanson and J. W. Hall, all of this city, and is at this time practically the only competitor the Iowa has for toll line and exchange business in Jasper county.

DES MOINES, IOWA.—The plan of the independent toll-line telephone companies of Iowa to take over the preferred stock issued by the Mutual Telephone Company of Des Moines, Iowa, and thereby control that system, has been abandoned for the present.

The companies are in much the same condition, finding that their business has increased beyond their ability to carry it on.

DES MOINES, IOWA.— The stockholders of the Trans-Mississippi Telephone & Telegraph Company, organized in Des Moines, expect to establish a long-distance telephone system which will connect up the 200 independent telephone systems in this state. The company will not do a local business or own local exchanges. The first line will be constructed from Council Bluffs to Iowa City, where it will connect with lines to Cedar Rapids, Muscatine, Burlington and Keokuk. Later a line will be constructed across the southern portion of the State, probably along the Chicago, Burlington & Quincy, and following that line across the northern part of the state, probably along the Illinois Central, which passes through a number of cities and towns having prosperous telephone systems.

The company is capitalized for $100,000. The first officers are: President, J. W. Hill, Des Moines, president of the Des Moines Nursery Company, and founder of the Mutual Telephone Company of Des Moines; vice-president, F. C. Hubbell, president of the Des Moines Union Railway Company; secretary, Charles C. Deering, Boone; treasurer, M. McFarlin, of the McFarlin Grain Company, Des Moines; manager, A. T. Fresson, Iowa City.

FERTILE, IOWA.— D. H. Eagle, of Riceville, Iowa, has just completed a deal whereby he has become the owner of the local telephone system in Fertile. W. W. Eagle will be manager.

GRANGER, IOWA.— A telephone company was organized here, which will be known as the Granger Northwestern Telephone Company. J. Browdwatter was chosen for president, B. J. C. Lange, secretary, and J. W. Darrow, treasurer.

HUDSON, IOWA.— The farmers of Orange township held a meeting at the home of J. H. Cable and organized the Orange Telephone Association, with forty-eight members.

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HEPBURN, IOWA.—The Farmers' Mutual Telephone Company, which owns and operates a line between this city, Hepburn, and Clarinda, elected the following officers for the ensuing year: President, H. H. Murphy; vice-president, F. Robinson; secretary, James Swan; treasurer, Dr. West; directors, Monroe McCoy, Z. Shepherd, Samuel Hollis. It was decided to run another wire to Clarinda and put in an exchange to connect with other mutual lines at both Villisca and Clarinda.

HEDRICK, IOWA.—The Hedrick Telephone Company has increased its capital stock to $40,000.

HILTON, IOWA.—The following temporary officers have been elected by our local telephone company: S. R. Black, president; H. A. Ahrens, secretary; John Ahrens, treasurer; Gottfried Fuller, George Von Lienen and Herman Ahrens, directors. The line will be built at once.

IOWA FALLS, IOWA.—The Hardin-Franklyn County Rural Telephone Company was organized in this city. The first line to be built by this company will run from this city to several points in Lee township in Franklyn county, and will eventually be extended farther in that direction. Other lines are being projected, and will soon be built in Grant township in Franklin county, and to Ellis township, south of this city. The officers of the new company are as follows: President, Henry Buzzell; vice-president, Levi Thorpe; secretary, Dr. M. W. Hill; treasurer, C. M. Comeley.

IOWA CITY, IOWA.—The Johnson County Telephone Company, of Iowa City, Iowa, is about to rebuild some of its lines. A line is being constructed to Oxford, Holbrook, and Parnell.

KINGSLEY, IOWA.—Harter Brothers expect to have the local telephone exchange completed and in running order this week. The exchange will be connected with the Jefferson line here.

KELLERTON, IOWA.—A meeting was held for the purpose of organizing the Kellerton Central Telephone Company. W. W. Peasley was elected president, W. G. McCleary treasurer, and O. B. Overholser secretary.

LAWN HILL, IOWA.—The new telephone people elected their officers: Z. Thompson, president; Fred Smith, vice-president; Ed. Elerding, secretary; D. R. Clark, C. C. Conklin, Lewis Johnson, directors.

MELROSE, IOWA.—The Melrose & Chariton Telephone Company, of Russell, Lucas county, has been incorporated, with $2,000 capital stock. The incorporators are: W. J. Marshall, G. B. Vanarsdale, H. O. Penick, C. E. Stewart, P. R. Fogg, C. R. Kirk, H. M. Hatcher and others.

MT. AYRE, IOWA.—At a meeting of the stockholders articles of incorporation were submitted by the committee. Five temporary officers were elected, as follows: John H. Allyn, president; Carl Lunney, vice-president; G. A. Wyant, secretary: Clyde Dunning, treasurer. The name of the organization is The Mt. Ayr Mutual Telephone Company.

MUSCATINE, IOWA.—The West Liberty Telephone Company has been granted the use of the streets and alleys of Muscatine, Iowa, to erect its poles.

NEWTON, IOWA.—Articles of incorporation were filed by the Jasper County Telephone Company. The capital stock is $60,000, and the incorporators are: H. J. Blanchaine, P. C. Dings, F. E. Wettstein and Dr. I. S. Mahan, all of La Porte, Iowa. The principal place of business will be Newton, Jasper county, Iowa.

NEW LONDON, IOWA.—The Henry County Telephone Company has succeeded in raising the additional stock of $3,000, which will make the capitalization $5,000. E. A. Stephenson, of Lowell, was elected president; J. E. Peterson, vice-president; A. D. Hayes, secretary; P. Hillyard, treasurer, the latter all of New London.

ONAWA, IOWA.—An organization has recently been formed called the Monona Telephone Company, at this place, and elected the following officers: J. W. Huff, president; Fred Marquis, secretary; C. H. Huntington, treasurer. The company has a capital stock of $10,000, and proposes to build lines to Turin, Castana, Mapleton, Ute, Soldier and Moorhead, and back to Onawa, and obtain franchises from the different towns of the county for local exchanges.

OELWEIN, IOWA.—The Sumner Telephone Company, which was granted a local franchise at Oelwein, Iowa, has failed to install the exchange.

PANORA, IOWA.—Panora business men have organized an independent telephone company to build an exchange and to connect with the country telephone lines being built in that vicinity.

PETERSON, IOWA.—Some time ago the telephone exchange of Peterson was sold to Sioux Rapids parties. Now H. A. Johnson has purchased the exchange.

PARKERSBURG, IOWA.—A new telephone enterprise has recently been formulated in Parkersburg, Iowa, and is comprised of local capitalists and the old Cedar Valley Telephone Company. A new switchboard will be put into the local exchange and additional poles and wires set up.

SALEM, IOWA.—M. S. Briggs has put in an exchange here known as the Salem Telephone & Telegraph Company. He builds lines and establishes offices to Hillsboro, Cottonwood, Denova, Houghton, and probably Mt. Pleasant and Trenton. It is connected at Denova with the Frame-Fisher Telephone Company, at Hillsboro with the Big Mound & Primrose Company.

SIOUX FALLS, IOWA.—The Iowa, Dakota & Minnesota Telephone Company was organized about six months ago with a capital stock of $100,000. The general office is at Sioux Falls, South Dakota, and there is a branch office at Britt, Iowa, The officers of the company are as follows: Thomas A.

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Way, president; Stitzel X. Way, vice-president; T. A. Potter, general manager; B. C. Way, secretary, and E. P. Healy, treasurer. This company owns and operates telephone lines in Iowa, Minnesota, and South Dakota.

STORM LAKE, IOWA.—The council granted the Alta Telephone Company, composed of D. E. Hadden and G. F. Tincknell, permission to use the streets and alleys to install a local exchange.

SWEETLAND, IOWA.—Several farmers of Sweetland and vicinity organized a telephone company. A. N. Day was elected president and Dr. Snyder secretary.

WASHINGTON, IOWA.—Robinson & Wilson have connected their exchange at Washington, Iowa, with the toll system in southeastern Iowa, operated by J. C. Hubinger.

WHITING, IOWA.—The Whiting town council has granted a franchise for a local telephone exchange.

WINTERSET, IOWA.—The Hawkeye Telephone Company will build a new line from Winterset to Des Moines by way of Patterson and Bevington, and possibly Indianola. The company has also secured a franchise at Greenfield and it is likely that a line will be built connecting that town with Winterset in the near future.

KANSAS.

BEATTIE, KAS.—The city has granted a franchise to the Beattie Telephone Exchange.

BERN, KAS.—Bern has organized a local company for the purpose of putting in a telephone system. The capital stock is $1,100. W. R. Guild is president, A. L. Scott vice-president, and G. M. Kinyon treasurer.

HUTCHINSON, KAS.—A franchise has been granted by the Hutchinson council for the construction of an independent telephone exchange here. Mr. Bellamy, president of the exchange at Knoxville, and W. E. Burns, of this city, will put in the new exchange, and it will be one of the chain of independent companies in the state which expect to unite by long-distance lines so as to enter a statewide competition with the Bell Telephone Company.

HOISINGTON, KAS.—G. W. Yenser has resigned his position with the Kansas Lumber Company and leaves for Hoisington, Kansas, where he will construct a telephone exchange. After he completes his exchange at Hoisington he intends to remove to Harper, Kansas, where he will erect a second telephone system.

NESS CITY, KAS.—A telephone company was organized here, with a capital stock of $5,000, and the following officers elected: I. O. Shellenberger, president; Paul Klein, vice-president, and Charles L. Rogers, secretary and treasurer.

PONCA CITY, KAS.—A charter was granted to the Osage & Eastern Oklahoma Telephone Company, with headquarters at Ponca City, for a period of thirty years. The capital stock of the concern is $10,000, and the property now owned amounts to $5,000. The directors of the company are: James H. Clapp, Ponca City; D. Lafe Hubber, Ponca City, and Otto A. Elliott, Newkirk.

KENTUCKY.

BORDEN, KY.—A new corporation, known as the Overland Telephone Company, is preparing for the construction of a telephone line from Borden to Henryville, Kentucky, by way of Nenze.

HODGENVILLE, KY.—The town trustees sold a telephone franchise to the Cumberland Telephone Company for $35. An exchange will be put in here.

HAWESVILLE, KY.—Hancock County Telephone Company has filed articles of incorporation; capital, $3,000; incorporators, I. C. Adair and W. E. Ford.

LOUISVILLE, KY.—The Home Telephone Company, recently incorporated with a capital of $500,000, is said to have received 1,600 subscribers who have signed three-year contracts, and promises to begin business when 3,000 have been secured. John Armstrong, a local capitalist, is president, and E. W. Coleman, secretary and manager.

LUDLOW, KY.—Colonel J. J. Weaver has been granted a twenty-year franchise by the city council to erect telephone poles and wires.

SHARPSBURG, KY.—Stockholders of the Sharpsburg Home Telephone Company met and organized by electing the following officers: President, B. T. Wright; first vice-president, W. H. Pieratt; second vice-president, W. H. Ratliff; secretary, B. B. Whaley; treasurer, W. R. Knight. Town trustees accepted the bid of $80 of the Sharpsburg Home Telephone Company for a franchise to erect, operate and maintain a telephone exchange. The capital stock is $3,500.

SEBREE, KY.—The Sebree Independent Telephone Company, of Webster county, has filed articles of incorporation; capital stock, $5,000.

TAYLORSVILLE, KY.—The Taylorsville & Bethlehem Telephone Company and the Normandy & Williamsville Telephone Company, both of Spencer county, have filed articles of incorporation.

MARYLAND.

BALTIMORE, MD.—The Atlantic Wireless Telegraph & Telephone Company was incorporated by Richard P. Simpson, Robert E. Lee Cunningham, Harry B. Cook, Willard F. Taylor, William I. Cook, Charles H. McDonnell and William Byrne. The stated capital stock is $5,000,000, divided into 5,000,000 shares of $1 each. It is said the promoters of the company have the rights for the Marconi system in Maryland, the Virginias and the Carolinas.

BALTIMORE, MD.—The Chesapeake & Potomac Telephone Company has put into service in its main exchange a $125,000 new relay common battery switchboard, said to be the largest of its kind in the world.

HYATTSVILLE, MD.—Chesapeake & Potomac Telephone Company, Baltimore, has franchise for telephone system in Hyattsville.

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MASSACHUSETTS.

LYNN, MASS.— The Peoples Telephone Company, which was recently granted a franchise to operate a telephone exchange in Lynn, Massachusetts, has filed its bond for $10,000, with the city clerk. This bond is to insure the carrying out of the agreement with the city according to the provisions of the franchise granted. The engineering department of the company will shortly commence work on the plans for construction work.

WORCESTER, MASS.— Worcester, Massachusetts, is to be made a link in a wireless telephone and telegraph system, extending from Boston to New York, and already men have been in the city looking over the ground. The line is to be built by the New England Wireless Telegraph & Telephone Company, with headquarters in Boston. The instruments for the establishment of the line are now being made in Boston, and the books of the company have been opened for subscriptions. The company is a licensee of the American Wireless Telegraph & Telephone Company, and $1,250,000 of the stock of the New England company is to be placed in the treasury of the parent company. The president of the New England company is J. H. Huston, and the office of the company has been established in the Boylston building, Boston, Massachusetts.

MICHIGAN.

COOPERSVILLE, MICH.— At the annual meeting of the Mutual Telephone Company at Coopersville it was decided to sell the entire exchange, with city and long-distance lines, to the Muskegon Citizens Telephone Company. The company has forty-five subscribers in Coopersville. New officers and directors of the company were elected as follows: President, M. Durham; vice-president, William Mines; secretary, F. J. Fox; treasurer, A. F. Parkhurst; manager, D. C. Oakes; directors, J. V. Woodbury and S. Leppers.

DETROIT, MICH.— The United States Telephone Company will build simultaneously with the Everett-Moore Detroit & Jackson work a toll line from Detroit to Pontiac, and from Holly, which is already connected with Pontiac, to Corunna, with a branch line from Fenton to Flint. These lines will afford a straight connection between Saginaw, Bay City and Saginaw Valley, and nearly straight connections between Detroit and Grand Rapids.

EASTON, MICH.— Incorporated: Easton Independent Telephone Company, Strong Station; $1,000.

FENTON, MICH.— The annual meeting of the Fenton Mutual Telephone Company was held, and the board of directors elected officers as follows: President, C. J. Campbell; vice-president, J. H. Jennings; secretary and treasurer, H. J. Phillips; superintendent, A. H. Douglas.

GRAND RAPIDS, MICH.— The directors of the Citizens Telephone Company have authorized the building of several important lines for the farmers, to be connected with exchanges in Hastings, Lowell, Cedar Springs and Rockford. There will be about sixty miles of these lines. They also ordered the building of considerable extensions of the State toll lines in counties north of Grand Rapids.

OWOSSO, MICH.— The Union Telephone Company of Alma has purchased the Owosso company's exchange. The Owosso exchange is in flourishing condition, and has 400 'phones in use. The Union company will immediately begin the erection of a copper line to Detroit. There will be no change in the management of the local company.

PLAINWELL, MICH.— Poles are being erected in the village for the telephone line between Allegan and Plainwell, the franchise for which was recently granted Milton D. Owen, of Allegan. The Peoples Telephone Company has been granted a franchise in Plainwell, Michigan. Work on construction will begin at once.

TOWNHOUSE, MICH.— At the last meeting of the several telephone companies all were consolidated into one company, to be known as the Rollin Telephone Company, with the main office at Townhouse. Austin Fitts, president, and Llewellyn Harkness, secretary.

SPRINGPORT, MICH.— Articles of association of the Springport Mutual Telephone Company have been filed in the office of the county clerk. The principal office of the company is located at Springport. The capital stock is $5,000, divided into five hundred shares of $10 each. The board of directors is composed of Seward E. Whitman, William E. Baum, Charles G. Wilkes, D. W. Trine, George R. Weldon, Frank Elmer, G. M. Tabor, George W. Herrick, and William Gibbs.

STANTON, MICH.— The Union Telephone Company is making preparations to build a new exchange at Stanton. New copper wire will be put up in place of the steel wire now used, and in all about $3,000 expended on the exchange.

MINNESOTA.

BRAINERD, MINN.— The Northwestern Telephone Company, thru C. W. Baumbach, of Wadena, has a proposition before the city council in which it asks for permission to put up poles and wires for a new telephone system; to furnish the city four 'phones free of charge, and also to charge citizens not to exceed $2 per month for office 'phones and $1 per month for residences. The present price paid the local telephone company is $3 and $1.50, respectively.

BLOOMING PRAIRIE, MINN.— The Steele County Telephone Company is about to begin work on the local exchange at Blooming Prairie, Minnesota. As soon as that is completed, a line will be extended to Corning.

CROOKSTON, MINN.— The Crookston Telephone Company has transferred its lines and entire system and franchise here to the Iron Range Electric Telephone Company,

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whose headquarters are at Wadena. The new company will use Crookston as a base of supplies, and will build long-distance lines to Duluth along the Great Northern system. It has also secured from the Northwestern company territory in Norman and Clay counties, and will cover the towns therein. The Iron Range Company is officered by A. B. Kerlin, Park Rapids, president; W. R. Baumbach, treasurer, and C. W. Baumbach, secretary, both of Wadena; and its capital stock is $100,000. The price paid the local company was $15,000, and stock valued at $7,000. The construction of the new lines will begin this summer.

CLOQUET, MINN.—A franchise for erecting poles and wires for a telephone system has been granted by the village council to the Zenith Telephone Company, of Duluth. The Duluth Telephone Company has already been giving telephone service for over a year, and within the past week has established a local exchange and made C. L. Dixon, bank cashier, manager.

DULUTH, MINN.—The Zenith Telephone Company, of Duluth, has filed a trust deed to the Minnesota Loan & Trust Company, of Minneapolis, as security for $100,000 bonds. The company makes the issue of bonds to extend its toll system.

MURDOCK, MINN.—At a meeting of Murdock business men the Murdock-Carlson Telephone Company was organized by the election of the following officers: President, C. H. Fredrickson; vice-president, L. H. Lawson; secretary, A. L. Bergstrom; treasurer, John Brandt. The object of the organization is the construction of a telephone line from Murdock to Carlson.

MAINE PRAIRIE, MINN.—Work on the new telephone line from Maine Prairie to Kimball, Minnesota, has commenced. Dr. Shercourt, it is understood, is backing the enterprise.

MINNEAPOLIS, MINN.—The Twin City Telephone Company, which lately bought up the St. Paul and Minneapolis exchanges of the Mississippi Valley Telephone Company, is about to expend over $500,000 on improvements on its telephone system in Minneapolis alone. The improvements will consist of the erection of a main exchange building, the entire cost of which will be about $100,000; the erection of a sub or branch exchange, to cost nearly $30,000, and the erection of an east side exchange, which will involve an expenditure of nearly $100,000.

PRINCETON, MINN.—Articles of incorporation were filed by the Minnesota Rural Telephone Company recently. Headquarters, Princeton; capital stock, $50,000: incorporators, Louis Rust, Edward L. Saxon, Clarence T. Johnson, all of Princeton, and Louis Erickson and Andrew E. Westling, of Wyanette.

STAPLES, MINN.—The village council passed an ordinance granting a telephone franchise to D. N. Tallman, who recently purchased the Northern Minnesota Telephone Company of A. B. Kerlin.

SULLIVAN, MINN.—The Sullivan Telephone Exchange has been incorporated to operate a local exchange. Incorporators, John R. Pogue, A. O. Harrison, Sarah H. Kirk, John L. Kirk and James L. Kirk.

SHERBURN, MINN.—The Fairmont Telephone Company is building a new line from Sherburn, Minnesota, to Estherville, Iowa.

RINDAL, MINN.—The Gary Telephone Company will extend its line from Rindal to Fertile, Minnesota.

WINONA, MINN.—The Winona Telephone Company of Winona, Minnesota, will extend wires to Rochester, Minnesota.

WILLMAR, MINN.—H. J. Ramsett has disposed of his interest in the Willmar telephone exchange, of Willmar, Minnesota. He is succeeded as secretary by D. N. Tallman.

WINTHROP, MINN.—The Peoples Independent Telephone Company has been granted a franchise for a local exchange at Winthrop, Minnesota.

WADENA, MINN.—The directors of the Iron Range & Electric Telephone Company, with headquarters at Wadena, filed articles of incorporation recently with the Secretary of State. The company will do a general telephone business thruout the State, with a capital stock of $50,000, with the following officers: A. B. Kerlin, of Park Rapids, president; W. R. Baumbach, of Park Rapids, vice-president and treasurer; C. W. Baumbach, of Wadena, secretary.

MISSISSIPPI.

OXFORD, MISS.—Chartered: The Memphis & Oxford Long-Distance Telephone Company; capital stock, $25,000; by J. H. Harvey and A. E. Graham, for construction of a long-distance system; W. H. Harvey, general manager.

SAREPTA, MISS.—The Alabama, Mississippi & Tennessee Telephone Company has extended its toll line from Dallas to Sarepta, Mississippi, at which place it connects with the Sarepta & Water Valley telephone line. This connects the Pontotoc and Water Valley telephone exchanges, and gives the latter connection with the Amory, Aberdeen, West Point, Starkville, and Columbus exchanges.

MISSOURI.

AVON, MO.—The Ava Mutual Telephone Company, Avon; capital stock, $1,500; to operate a telephone system. Incorporators, George E. McFarland, A. Sundburg and G. S. Osborne.

GALT, MO.—Galt Telephone Company has been chartered, with capital stock of $2,400, by Robert Willis, J. T. Hudson, G. M. Bennett and others.

JACKSON, MO.—Another Jackson Township telephone company was organized. It is called the Grand River Telephone Company. M. Iglehart is president of the company, O. B. McCoy secretary, and Ed Stinchcomb treasurer.

LAWSON, MO.—The stockholders in the Lawson Telephone Company met and elected W. H. Myer, president and general man-

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ager; F. T. Crowley, vice-president; Dr. C. D. Weakley, secretary, and R. J. Clark, Jr., treasurer.

LUDLOW, MO.—Ludlow has organized a telephone company to be known as the Low Gap 'Phone Company.

WINDSOR, MO.—The Missouri Union Telephone Company elected officers for the ensuing year: President, J. D. Livingston; vice-presidents, W. H. Gibbins and W. J. Miller; manager and secretary, G. W. Schweer; treasurer, George R. Lingle.

NEBRASKA.

BARNSTON, NEB.—The Barnston Mutual Telephone Company was organized by the election of W. Y. York as president; W. D. Kier, vice-president; Thomas Hand, treasurer, and P. Ryan as secretary. Construction of lines to the east and south of Barnston will be commenced at once.

BRADY ISLAND, NEB.—The Maxwell & Brady Island Telephone Company was organized. William Plummer is president, Ed Murphy treasurer and G. S. Swancutt secretary. The new company will build a telephone line from Brady Island to North Platte and has begun work.

BASSETT, NEB.—Articles of incorporation have been filed with the Secretary of State by two new telephone companies. One is the Bassett-Springview telephone line and the other is the Farmers' & Merchants' Telephone Company in Harlan county.

The first organization has a capital stock of $3,000 and its purpose is to operate a telephone line from Bassett, in Rock county, to Carns and Springview, in Keya Paha county. The officers are as follows: President, J. D. Brayton; C. E. Lear, vice-president; C. F. Stockwell, treasurer; M. L. Mead, secretary.

The Farmers' & Merchants' Telephone Company of Harlan county is to have its principal place of business at Alma. The incorporators are R. L. Keester, Dan Sullivan, F. W. Stevens, Otto Bloom, J. C. Mitchell, Ed Shaffer and J. L. Porter, of Alma; James Hunter, C. A. Luce, Grant Gifford, A. T. Smith, Republican City; B. R. Clayford, A. M. Beersford, Orleans. The capital stock is $10,000.

FREMONT, NEB.—A. B. Cooling, of Iowa City, asks franchise to build an independent exchange.

HUMBOLDT, NEB.—The rural telephone company of Speiser and Humboldt townships has completed organization and sold the bulk of the shares. Construction work will be begun at once.

HAY SPRINGS, NEB.—The Hay Springs Telephone Company has been organized, to construct and operate a telephone to Moomon, a distance of twenty miles south of this place, then to connect with the Pine Creek company's line, extending into the heart of the sand hills cattle country.

HUMBOLDT, NEB.—The Rural Telephone Company, of Humboldt, Neb., and Spieser townships, has completed organization and sold the bulk of the shares. Construction has begun and before many weeks connection will be made with the local city exchange and toll lines. The Rural system covers quite an area and will no doubt be a great advantage to the farmers.

LIBERTY, NEB.—The Independent Telephone Company, which was organized here some time ago, has proven a success. Seventy-five shares have been sold and forty miles of line are under construction.

NEW JERSEY.

ATLANTIC CITY, N. J.—The Eastern Telephone & Telegraph Company will extend its lines to Atlantic City and Cape May. This was decided upon at the annual meeting of the stockholders. Connections will also be made with the Keystone Company of Philadelphia. The company has spent about $150,000 in extending its service during the past year.

CAMDEN, N. J.—The Interstate Telephone Company, Camden, N. J., to operate telephone lines. Capital stock, $100,000. Incorporators: Paul W. Muller, Camden, N. J.; Max Philipps and F. R. Hansell.

CAMDEN, N. J.—The Camden Telephone Company of Camden, Tenn., has been incorporated by W. L. Morris, T. J. Lowry and others.

NEW LISBON, N. J.—The Union Telephone Company has been incorporated. Capital $3,000. Incorporators: Wm. H. Reeves, Alfred J. Davis, M. Warner Hargrove.

TRENTON, N. J.—The American Home Telephone Company has been incorporated. Capital, $2,000,000. Incorporators: Alfred G. Brown, of East Orange, N. J.; Edward B. Hawkins, Edward T. Magoffin.

TRENTON, N. J.—The Southern Central Telephone Company, Trenton, N. J. Capital stock, $10,000,000. Incorporators: John W. Avery, Osborn Congleton and Horace E. C. Thompson, of New York.

NEW YORK.

ALBANY, N. Y.—Still another telephone company has entered the local field. It is the Home Telephone Company, of Albany, and it filed papers with the secretary of state. The places in which the company is to operate are Albany, Watervliet, Green Island, Cohoes and towns and villages adjacent, Rensselaer, Delmar, Altamont, West Berne, Preston Hollow, Westerlo, Clarksville, Ravena, Coeymans, Cedar Hill, Bethelehem Center and the towns and villages along the line. The capital stock is $750.000. The directors and their holdings are as follows: Samuel B. Rawson, Frederick H. Sutro, Theodore M. Bursh, Frederick W. Martin, Irving H. Griswold and Addison B. Lord, all of Elyria, Ohio, each five shares; George C. Lee, Jr., Howard Hendrickson and William H. Keeler, of Albany, each five shares.

BATAVIA, N. Y.—The Batavia Home Telephone Company was incorporated with a capital of $160,000, to operate a telephone line in Genesee, with Batavia as the central point. The directors are Samuel B. Rawson,

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Addison B. Lord, of Elyria, Ohio; Alfred R. Smith, of North Tonawanda, and George C. Frost, of Buffalo.

BORDEN, N. Y.—A new corporation known as the Overland Telephone Company is constructing a telephone line from Borden to Henryville, Ky., by way of Nenze.

BRANCHPORT, N. Y.—The Independent telephone line from Branchport to Pulteney is now assured, and representatives of both places met and decided to erect it as soon as possible. An effort may be made to extend the line to Bluff Point and Italy Hill.

EAST AURORA, N. Y.—The Buffalo Valley Telephone Company has elected W. H. Richardson, of Warsaw, president; R. G. Watson, of Strykersville, vice-president; F. R. Whaley, of this village, treasurer; and J. D. Wooster, of Wales, secretary and manager.

HAMMONDSPORT, N. Y.—Messrs. Hubbell, Fuller and Stowe have applied for a telephone franchise in this village. Their plan is to organize a local company, if possible, the line to be a portion of a system ultimately intended to cover this and adjoining States. The franchise will doubtless be granted.

ITHACA, N. Y.—The Century Telephone Construction Company, of Cleveland, which is building a number of exchanges in New York State, has made application for a franchise here.

NEW BERLIN, N. Y.—A new company has recently been incorporated for $3,000 in New Berlin, N. Y., to install a local telephone service.

SALAMANCA, N. Y.—Irving Hall is building a telephone line from East Randolph to Steamburg and Tunessassa. He will connect with the independent telephone line at Salamanca, and get connections with Red House and Little Valley.

SARATOGA SPRINGS, N. Y.—The Saratoga Telephone & Telegraph Company has been incorporated at Saratoga Springs, N. Y., with an authorized capital stock of $125,000. It is the purpose of the company to operate in Saratoga Springs, Ballston Spa, Mechanicsville, Stillwater, Waterford, Troy, Schuylerville, Glens Falls, Schenectady, and in the various cities, towns and villages of Saratoga, Fulton, Warren and Schenectady counties. The directors of the company are F. K. H. Beach, Stephen C. Medbury, J. W. Wiswall, Herbert C. Westcott, Charles W. Cool, W. L. Burke and William P. Burtley.

At a meeting of the stockholders of the Saratoga Telegraph & Telephone Company the following officers were elected: President, S. C. Medbery, Ballston Spa; secretary and treasurer, W. L. Burk, Glens Falls; directors, W. L. Burk, Charles W. Cool, William F. Bentley, Glens Falls; S. C. Medbery, I. W. Wiswall, F. H. Beach, H. C. Westcott, Ballston Spa.

WATKINS, N. Y.—The newly incorporated Watkins, N. Y., Telephone Company was authorized to build, maintain and operate a first-class telephone system within the limits of that village. The company at present consists of B. G. Hubbell, J. H. Fuller and C. B. Stone, all of Cleveland, Ohio. Work must be begun within ninety days, or the franchise will be declared void. These directors are the same men who recently applied for the telephone franchise in Elmira, N. Y.

TROY, N. Y.—The Rensselaer Telephone & Telegraph Company will build underground conduit lines for the new independent exchange. W. L. Burk will have charge of construction work. W. H. Yerkes, Jr., represents the company. Rates will be $40 for business houses and $24 for residences.

The new Bell rate is $30 for 500 calls.

The Troy Telephone & Telegraph Company has lowered its rate to $30 a year for a business place and private residence. This rate, which went into effect recently, is for a long-distance instrument, with metallic circuit. The equipment, the telephone people say, will be the best that can be procured. The new rate is the same that prevails in Albany. The company has given out an official statement in which it refers in subtle terms to the attitude of the city authorities on the question of underground wires.

OHIO.

AKRON, OHIO.—The Garl Electric Company, of Akron, has been incorporated, with a capital stock of $25,000, the incorporators being F. H. Lyder, J. W. Lyder, J. W. Lyder, Jr., G. W. Clemmer and A. J. Rowley. The company will manufacture telephones, hotel telephone systems and portable telephones for use on electric cars. The systems are the inventions of M. Garl, but the patents have been purchased by F. H. Lyder.

ASHLAND, OHIO.—The Star Telephone Company is preparing to rebuild its system in this place and has placed contracts with the Kellogg Switchboard & Supply Company, of Chicago, for four hundred new telephones and a 600-drop switchboard on the central energy system. A number of new toll lines will be built and long-distance connection will be made over the lines of the United States Telephone Company. The capital stock of the company has been increased from $50,000 to $100,000.

ALLIANCE, OHIO.—R. Beacon, general manager of the Stark County Telephone Company's exchange, will in future have charge of the Canton exchange as well as the Alliance.

BETTSVILLE, OHIO.—The citizens of Bettsville, Ohio, have concluded that they have been behind the times long enough, and are making arrangements to have a telephone exchange installed in their village. F. E. Vorheis, of Gibsonburg, Ohio, is behind the project, and will have charge of the work. It will be an independent exchange.

BEVIS, OHIO.—There is a movement on foot to establish a telephone service in the villages in Hamilton county along the line of the Southern Ohio Traction Company. S. A. Butterfield and J. R. Bevis, of Bevis, Ohio, have charge of the right-of-way, but

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it can not be learned at this time what system is to be used.

BROOKVILLE, OHIO.—The Acme Telephone Company will put in an exchange at this place for local purposes, with connections with about forty surrounding towns and cities.

BURTON, OHIO.—The Burton Telephone Company, Burton, Geauga county, has increased its capital stock from $5,000 to $15,000.

BERLIN HEIGHTS, OHIO.—The village council granted a franchise to an independent company headed by J. R. McKnight, of Norwalk, Ohio.

CLEVELAND, OHIO.—The United States Telephone Company has inaugurated a one-minute service between Columbus and Cleveland at the rate of 40 cents for the first minute and 15 cents a minute after that. The old rate was 70 cents for the first three minutes and 15 cents for each additional minute. The same arrangement has also been made between Columbus and a number of other towns in the State, with corresponding tolls.

CLEVELAND, OHIO.—H. W. Crumb, of the Pittsburg & Allegheny Telephone Company, was in this city recently perfecting arrangements for the completion of the long-distance line which his company is building in connection with the United States Company between Cleveland and Pittsburg. This line will be completed within the next two weeks and will give connection with 4,000 telephones at Pittsburg and Allegheny, besides many exchanges in Pennsylvania.

CANAL WINCHESTER, OHIO.—The Franklin County Telephone Company has opened its exchange in this place, with fifty-five subscribers.

COLUMBUS, OHIO.—Incorporated: The Henry County Home Telephone Company, Columbus, Ohio. Capital stock, $50,000.

COLLINWOOD, OHIO.—The Collinwood Home Telephone Company held its annual meeting recently, when the company was reported to be in excellent financial condition. There are 320 telephones in operation, with twenty-two on a waiting list. A 2½ per cent dividend was declared and arrangements made for new equipment. The officers were reëlected as follows: J. M. Hart, president; W. G. Griswold, secretary-treasurer; directors, E. L. Barber, W. F. Parsons, Dr. J. S. Wood, S. O. Davis, J. M. Hart and W. G. Griswold.

COLERAIN, OHIO.—A local telephone system is being organized in this neighborhood. E. B. Steer, Ogden Bracken, L. C. Steer, are the promoters.

CLINTON, OHIO.—The Clinton Telephone Company is arranging to at once begin building exchanges in Blanchester and New Vienna. After these exchanges are finished the company will then turn its attention to Clarksville, Martinsville, and the other towns of the county, so that before the summer is over the Home company will have its county system completed.

DAYTON, OHIO.—The Dayton & Troy, Ohio, Electric Railway Company has changed its charter so as to enable it to conduct a telephone and electric lighting business and to make traffic arrangement with other roads.

DAYTON, OHIO.—The Progress Telephone & Telegraph Company, of West Milton, has secured a franchise to run lines into Dayton, and one hundred subscribers have been secured.

DELAWARE, OHIO.—The Citizens' Telephone Company is erecting new cables and installing an additional switchboard. The company has 553 subscribers connected up at the present time.

DRESDEN, OHIO.—The Merchants' Telephone Company has been granted a franchise to build an exchange at Dresden. The company owns several tolls lines in Muskingum, Coshocton, Holmes and Wayne counties. It is stated that the Zanesville Telephone & Telegraph Company will also build a line into that town. The Central Union already has an exchange there.

GALLIPOLIS, OHIO.—The Ohio Telephone & Telegraph Company has been granted a franchise to operate a toll station in Gallipolis. Local papers say that it looks very much like a franchise to operate another exchange in the town. There was quite a little opposition to the passage of the ordinance, as the people do not want three exchanges, but it went thru.

HILLSBORO, OHIO.—The Hillsboro Telephone Company, of Hillsboro, Ohio, recently organized, elected the following-named officers: President, Irvin McD. Smith; vice-president, Frank Durnell; secretary and treasurer, H. P. Morrow; directors, Irvin McD. Smith, John R. Horst, Julius C. Feibel, J. W. Evans, Frank Durnell, George L. Garrett and C. E. Brown.

HOWARD, OHIO.—A company headed by Thomas Shiple, Anthony White and others is being formed to build a telephone line from Danville to Gambier (via Millwood and Howard), to be known as the Danville, Howard & Gambier Independent Telephone Company, with the offices located at this place.

KENTON, OHIO.—The Kenton, Ohio, Telephone Company is extending its lines all over the eastern part of Hardin county. A number of the farmers have had telephone service for the past few months, and on account of the satisfaction given, the county will be a network of rural lines before the close of the year.

KENT, OHIO.—The Kent Home Telephone Company has ordered an additional section of switchboard to accommodate four hundred drops. Fifty miles of toll line are being built and fourteen toll stations are being installed in surrounding towns. North Electric Company's apparatus is to be used thruout.

LONDON, OHIO.—The London Telephone Company has been incorporated, with $75,000 capital stock.

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LANCASTER, OHIO.—The Lancaster Telephone Company has been granted a franchise in Fairfield county. An exchange will be built there.

MASILLON, OHIO.—A franchise was recently granted to the Masillon, Ohio, Telephone Company to operate an exchange in that city. The company has thirty-five subscribers to start with and has a number of others promised.

MARTIN'S FERRY, OHIO.—The Belmont Telephone Company will commence shortly to put up its poles in Martin's Ferry, Ohio. The only delay is the non-arrival of a sufficient number of poles to keep the men at work. It expects to have the 'phones in operation by July 1, as the contracts call for.

MIDDLETOWN, OHIO.—The Middletown city council, after carrying an ordinance granting the newly organized Citizens' Telephone Company a twenty-five years' franchise to its third and final reading, suddenly reversed favor and allowed the measure to die.

The council then ratified an agreement to extend the Miami Telephone Company's franchise for a like period, in view of certain promises on the part of the Miami Company to improve its present city system, furnish four new free telephones to the various city departments and put a new schedule of rates in force to its local patrons.

MALINTA, OHIO.—The meeting of the people connected with the Citizens' telephone exchange was held.

The first line centering at Malinta was built last December, and since that time franchises to erect and maintain these lines have been secured in the following towns: McClure, Weston, Malinta, Hamler and Holgate.

The following officers were elected: President, S. R. Hashbarger, Hamler; vice-president, George V. Rudolph, McClure; secretary, Henry Geist, Malinta; treasurer, Almemzer Packard, Malinta.

The following committee was appointed to make application to the village council of Napoleon for a franchise to erect and maintain a telephone exchange: Amos Blank, Frank Mitchell, George V. Rudolph and S. R. Hashbarger.

NEW PHILADELPHIA, OHIO.—E. S. Cook, F. S. McGowan, M. L. Fowler, M. M. Kelchner and M. R. Dickey, Sr., of New Philadelphia, incorporated the Tuscarawas County Telephone Company. Capital stock, $200,000.

NAPOLEON, OHIO.—The stockholders of the Napoleon Telephone Company last week incorporated at Columbus under the name of the Henry County Home Telephone Company, of Napoleon, the incorporators being S. M. Heller, M. Donnelly and Fred Printis, of Napoleon, and James Brailey and Ed L. Barker, of Fulton county. The old Napoleon company was capitalized at $20,000 and the new one has raised it to $50,000. They will operate an exchange in Napoleon, with branch lines extending into Fulton, Defiance, Wood and Ottawa counties.

PAINESVILLE, OHIO.—The Painesville Telephone Company has purchased a building site and will erect and equip a new exchange building. E. L. House is general manager of the company.

PORT CLINTON, OHIO.—The Port Clinton Telephone Company, Port Clinton, Ottawa county, has been incorporated, with a capital stock of $40,000, by J. S. Brailey, R. S. Barber, Fred J. Ballenger, H. A. Barber, J. C. King and others. The company will build a plant at Port Clinton. Several of the incorporators are members of the Barber-Brailey Company, Wauseon, which is engaged in the construction business.

PLATTSBURG, OHIO.—Incorporation papers were filed with the Secretary of State last week by the Home Telephone Company of Plattsburg, the capital stock being placed at $10,000. The company proposes to build an exchange at Plattsburg and toll lines to Xenia, Urbana, London, Dayton, Washington Court House and other points. E. E. Hodge, J. L. Price, Carlton Henry, F. S. Wilson, D. H. Campbell, C. A. Snyder and J. C. McMillan are the incorporators.

SPENCERVILLE, OHIO.—The Spencerville Telephone Company has been incorporated by A. C. Burr, H. M. Ashton and others to build a local exchange. Capital stock, $20,000.

SPRINGFIELD, OHIO.—The United States Telephone Company has been given a franchise to operate a toll line and long-distance station in this city.

The Springfield Citizens' Telephone Company, Springfield, Ohio, has been incorporated, with a capital stock of $10,000, to build a local exchange in that town. The incorporators are George W. Dun, Paul Jones, W. D. Garst, Edward Denmead and H. C. Park.

John C. Dunn, of Columbus, promoter of the Home City Telephone Company, applied to the board of public affairs for a franchise for a local and long-distance telephone system here, and has incorporated the Springfield Home Telephone Company of Springfield, capital stock $300,000.

SALEM, OHIO.—The Columbiana County Telephone Company has closed a deal with the Phœnix Telephone Company, of Toronto, for the purchase of the exchanges at Toronto and New Cumberland. Both exchanges will be remodeled and will be given long-distance service.

SOUTH CHARLESTON, OHIO.—The local telephone lines of London and this place were merged into one company this week; capital stock, $75,000. Former Senator Jones, of London, was made president; J. F. Rankin, of this place, vice-president; Fred Pierce, manager; Robert Boyd, treasurer, and J. C. McMillan, secretary. Three of the directors are Cleveland men.

TORONTO, OHIO.—Manager W. F. Crossley, of the Columbiana County Telephone Company, was in Jefferson county, and at Toronto organized the Citizens' Telephone Company. The local telephone company's property and

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franchises were transferred to it. The system in Toronto will be rebuilt and renewed and a line from Toronto to Wellsville constructed.

TOLEDO, OHIO.—The Toledo Home Telephone Company, which is known as the Graves Company, and which is supposed to be backed by the Federal Telephone Company, of Cleveland, has secured about two thousand contracts for telephones. This is one of three companies which are working for a franchise in Toledo.

TROY, OHIO.—The Troy Telephone Company is installing an additional section to its switchboard, contract having been placed with the American Electric Telephone Company. The Troy Company is eighteen months old and has 423 subscribers connected up, with thirty on a waiting list.

THOMPSON'S CORNERS, OHIO.—The United States Telephone Company will erect an exchange building at Thompson's Corners, Cuyahoga county.

WINDHAM, OHIO.—F. B. Hopkins, of the Garrettsville Independent Telephone Exchange, has been granted a twenty-year franchise to operate and maintain telephones within the corporate limits of the village of Windham. The telephones will be operated from the central office in Garrettsville.

WAPAKONETA, OHIO.—The Wapakoneta Telephone Company is installing a Stromberg-Carlson switchboard of 500 drops capacity and has 130 subscribers connected. The promoters of this company are also building the following exchanges: New Carlisle, 200 drops; Cridersville, 100 drops; Waynesville, 100 drops, and Lake View, 100 drops. Franchises have been secured in all of these towns and contracts will be placed for apparatus in the near future.

WESTON, OHIO.—The Weston, Ohio, Mutual Telephone Company has been formed, with the following officers: President, I. B. Ballmer; secretary, G. W. Smith; treasurer, Ed Guyer; directors, J. E. Clark, Milton Brundage and L. H. Sheley.

George Russell, of Malinta, will ask for the establishment of a new telephone line at Weston, to be known as the Citizens' Telephone Exchange.

WAUSEON, OHIO.—The Northwestern Ohio Telephone Company is preparing to install subexchanges at Tedrow and Pettisville. The National Automatic system will be tried as an experiment.

Barber & Bailey, of Wauseon, Ohio, who in the past few years have established fifteen different independent telephone companies in various parts of Ohio, Indiana and New York, retaining an interest in nearly if not all, are endeavoring to form a combination of the fifteen companies.

TOLEDO, OHIO.—Mr. Fred J. Bollmeyer, of Wauseon, who has been in the telephone construction business of the Northern Construction Company, has disposed of his interests in that corporation and organized another company to operate on similar lines. The new company is the Western Construction Company, and will build, own and operate telephone lines thruout this section of the country. The headquarters of this company will be in Toledo, and offices have been opened in the Spitzer building, with President Bollmeyer in charge. At the present time franchises for telephone service are being negotiated in several Ohio cities.

ZANESVILLE, OHIO.—Reports from Zanesville, Ohio, state that the thirty days of open stock books, during which time the company's shares were offered for popular subscription, resulted in the taking up of every dollar's worth of stock. A portion of the company's equipment is already on the ground and active operations will be begun in a few days.

PENNSYLVANIA.

ATHENS, PA.—Franchises for telephone lines have lately been granted by the boroughs of Athens, Sayre, South Waverly and Towanda, Pa., to an organization of local capitalists. Application for franchises has been made in three other boroughs and in the city of Elmira by the same interests.

ALLENTOWN, PA.—It has been decided by the Lehigh Telephone Company, of Allentown, Pa., to construct two lines running into Berks county, one by way of Emaus and Macungie and thence to Reading; the other to run from Slatington to Hamburg. Thirty subscribers have been secured for the first line and forty-two for the second. The Lehigh Company will be remembered as the new independent corporation which owns half of the stock of the Schuylkill Valley Traction Company. The former has nearly 1,200 subscribers in Lehigh.

AMBLER, PA.—The United Telegraph & Telephone Company, thru its representative, F. D. Hobson, of Norristown, has purchased of John S. Buchanan, president of the Ambler Telephone Company, all of the stock of the company. Joseph Landis, general manager of the Keystone system, has been chosen general manager of the Ambler system.

ALBION, PA.—A small number of our enterprising citizens have formed a company, calling it the Albion Telephone Company, and are erecting an independent line.

BUTLER, PA.—A new telephone company has been organized at Butler, which promises cheaper service.

BRADDOCK, PA.—The Pittsburg & Allegheny Telephone Company, which controls the Allegheny County Telephone Company of Braddock, has decided to rebuild the entire system of the latter company. About $50,000 will be spent.

CHESTER, PA.—The stockholders of the Delaware County Telephone & Telegraph Company have sold the property and franchise of the company to the United Telephone & Telegraph Company.

HARRISBURG, PA.—The United Telephone Company, a long-distance rival of the Bell Telephone Company, has gained control of the Dauphin County Telephone Company, recently chartered by the State, and whose

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stockholders include a number of prominent residents of this city.

At a meeting of the board of directors of the Dauphin County Telephone Company the contract for construction of the plant and lines of the company was let to the Eastern Electrical Construction Company. The specifications on which the contract is based are for a complete plant of the most modern type, with switchboards at the Harrisburg exchange for 3,000 'phones and switchboards for Steelton and other contemplated exchanges. There will be seventy miles of pole line when the system is completed.

HAZLETON, PA.—At a meeting of the stockholders of the Anthracite Telephone Company the following were elected to serve the ensuing year: President, C. W. Kline; secretary-treasurer, John W. Crellin; vice-president and general manager, C. Mans.

PERKIOMEN, PA.—The Perkiomen Telephone Company will shortly erect poles and string wires. The line will be extended to Hillegass and Red Hill, Pa.

PENNSBURG, PA.—A number of business men of Pennsburg recently have organized a local telephone company. The committee of construction are Dr. W. H. Hunsberger, V. H. Steckel and T. H. Marsteller.

PITTSBURG, PA.—The Federal Telephone Company, whose office is in this city, has recently absorbed the following telephone companies located in western Pennsylvania: Elizabeth Telephone Company, Elizabeth, Pa.; Carnegie Telephone Company, Carnegie, Pa.; Latrobe Telephone Exchange Company, Latrobe, Pa.; McKeesport Telephone Company, McKeesport, Pa.; Washington County Telephone Company, Washington, Pa.; Washington Telephone Company, Washington, Pa.; Kiskiminetas Valley Telephone Company, Apollo, Pa.; Pennsylvania Telegraph & Telephone Company, Beaver Falls, Pa.; Ewing Telephone Company, Avonmore, Pa.; Home Telephone Company, Cecil, Pa.; Home Mutual Telephone Company, Canonsburg, Pa.; Home Mutual Telephone Company, Houstonville, Pa.; Local Telephone Company, Leechburg, Pa.; Home Mutual Telephone Company, McDonald, Pa.; Home Mutual Telephone Company, Venice, Pa.; Mutual Home Telephone Company, Washington, Pa.; Youngstown Telephone Company, Youngstown, Pa.; Coraopolis Telephone Company, Coraopolis, Pa.; Sewickley Telephone Company, Sewickley, Pa.

PITTSBURG, PA.—The Pittsburg & Allegheny Telephone Company is installing a number of automatic toll stations in this city as well as across the river, and the charge for three minutes' conversation will be 5 cents, which is half the amount charged by the local Bell Telephone Company. The new company has made wonderful headway here, and has now a total of 4,800 subscribers on the list, 1,600 having been added within the last three months.

It is announced that the Pennsylvania Railroad Company will soon have its own wires for long-distance telephone transmission all the way from Philadelphia to Pittsburg. The company already has a circuit thruout the length of the middle division of the road, Harrisburg to Altoona, 132 miles, and there are a number of stretches on the division west of Altoona. The division east of Harrisburg has telephone wires for much more than half its length already.

PHILADELPHIA, PA.—S. P. Light and W. D. Barnard, directors of the United Telephone & Telegraph Company of Philadelphia, Pa., have bought the Altoona-Phœnix Telephone Company. The purchasers will connect the local system with their recent purchases in Montgomery, Chester, Delaware, Lancaster, Lebanon, Northumberland, Montour, Columbia, Union and Lycoming counties.

TARENTUM, PA.—The Citizens' Telephone Company will commence building a modern plant within the next sixty days. The company will give its subscribers service to Kittanning, New Kensington, Wilkinsburg, Freeport, Leechburg, Apollo, Vandergrift, and later Pittsburg and Allegheny. The officers are: W. L. Loucks, president; J. B. Crawford, secretary; Charles Biehl, treasurer.

TROY, PA.—The Farmers' Mutual Telephone Company has been granted a franchise by Troy's borough council.

WASHINGTON, PA.—The charter of the Pennsylvania & West Virginia Telephone Company has been filed. The points to be connected are: Waynesburg, Greene county; Claysville, Washington county; Roseberry's Rock and Cameron, Marshal county, W. Va.; Burton, Wetzel county, W. Va.; and Blacksville, Monongalia county, W. Va., and intermediate points. The business of the company is to be transacted at Waynesburg. The directors of the company are: Wyet Sprowls, West Finley, Washington county, and James Burns, Windage, J. B. Fordyce and J. A. Carpenter, Pine Bank, James Durbin, Video, and J. P. Hagan, Hero, Greene county.

TENNESSEE.

GAINSBOROUGH, TENN.—At the annual stockholders' meeting of the Gainsborough, Tenn., Telephone Company, G. W. Stevens was elected president, James N. Cox, general manager, and J. T. Anderson, secretary and treasurer. The company plans extensive improvements to its various lines in the near future.

HARRIMAN, TENN.—The Citizens' Telephone Company, of Harriman, Tenn., has changed its name to the Tennessee Telephone Company. The charter has been secured and the capital stock placed at $10,000. Aggressive steps are being taken to perfect the system and get ready for service at an early day.

KNOXVILLE, TENN.—An application for a charter for the Hiwassee Telephone and Electric Company was filed. Prominent Knoxville men are interested. The capital stock is $10,000. Among them Charles Sey-

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mour, W. W. Lee, Richard Johnson, Norman B. Morrell and W. A. Huffaker.

KINGSTON, TENN.—The Tennessee Telephone Company has been incorporated, with capital stock of $10,000, by H. M. Carr, George M. Chandler, S. C. Brown and others.

LIVINGSTON, TENN.—The Overton Telephone Company has reorganized and increased its capital stock from $5,000 to $25,000, and will install an exchange and construct three hundred miles of line.

STRAWBERRY PLAINS, TENN.—Samuel McBee, Wm. S. Foster and others have organized company to establish telephone line.

NASHVILLE, TENN.—A charter has been issued to the Peoples' Telephone Company, of Stewart County. The capital stock is $3,000. The incorporators are W. T. Thomas, R. G. McFall, W. B. Scott, C. C. Lewis, W. O. Edwards, George Stacker and R. E. Thomas.

TEXAS.

ALVIN, TEX.—The Alvin & Angleton Telephone Company are again connected with the long-distance at Alvin. W. A. Weyant is general manager of the Alvin and Angleton system.

ANGLETON, TEX.—A company has been organized to build a telephone line from Angleton to Damon Mound. Mr. Weyant, general manager of the A. & A. line, is interested.

AUSTIN, TEX.—Two telephone companies are reported to have been recently incorporated in Austin, Tex., one being known as the Austin Telephone Company, with a capital stock of $1,000,000, and the other as the Austin City Telephone Company, with a capital stock of $100,000. The incorporators of the former company are Messrs. J. E. Boynton, J. B. Earle, C. H. Rose and others, and those of the last-named corporation, Z. B. Campbell, H. G. Baker and others.

BEAUMONT, TEX.—M. D. Shaw, of Ohio, has applied for municipal telephone franchise.

BRENHAM, TEX.—Direct telephone connection between Brenham and Caldwell, Tex., was established recently by the completion of the Trans-Telephone Company's lines to the latter place. The line will be carried north as far as Milano in that State as soon as possible, and will be extended south from Brenham.

CLEBURNE, TEX.—At a meeting of the city council the Independent Telephone Company, of Texas, was granted a franchise to do business in Cleburne. The name of the company in Cleburne will be the Johnson County Telephone Company.

EL PASO, TEX.—Mrs. M. A. Brett, who assisted her husband in the management of the old independent exchange at Detroit, and who since the death of Mr. Brett some time ago has been promoting independent exchanges in Texas, was in this city recently interesting local capitalists in the organization of a company to build an exchange at El Paso, Tex. Mrs. Brett has secured the franchise and has contracts from about seventy-five per cent of the telephone users in that city. Her El Paso mission was successful and the exchange will be built at once.

HILLSBORO, TEX.—E. M. Turner, of the Hillsboro Independent Telephone Exchange, is perfecting arrangements for the exchange. A $40,000 plant will be put in with all the latest improvements and appliances. It is the intention of the company to extend lines to every section of the county as rapidly as possible. This is the company recently granted the franchise here. The petition of T. R. Dean to erect a telephone line from Woodbury to Hillsboro was granted.

KEMP, TEX.—Chartered: Texas Telegraph & Telephone Company, with capital stock of $20,000, by George Mason, A. J. Still, Jr., J. W. Young and others.

LAKE CREEK, TEX.—Chartered: The Southern Telephone Company, with capital stock of $4,000, by C. M. Read, S. P. Buckler and J. A. Akard.

MOUNT CALM, TEX.—H. McFarlane, of Hubbard City, has placed an order for telephone supplies and will put in a telephone exchange at this place at an early date.

SAN AUGUSTINE, TEX.—Mr. King, of Nacogdoches, is putting in a telephone exchange here and extending the line from this place to Center, and has it about completed. He will also connect this place with Hemphill or Jasper, and probably both places.

AUSTIN, TEX.—The following charter was filed: The Commercial Telephone Company, of San Antonio; capital stock, $500,000; purpose, to maintain a telephone system in the counties of Orange, Jefferson, Liberty, Harris, Galveston, Fort Bend, Wharton, Colorado, Fayette, Caldwell, Gaudalupe, Gonzales, Bexar, Lavaca, Washington, Burleson, Milam, Robertson, Falls, Limestone, Navarro, Ellis and Dallas. Incorporators: Z. N. Campbell, P. M. Aubrey, of San Antonio; J. E. Boynton, of Waco, and C. M. Haskell, of Ottawa, Ohio.

Reports from San Antonio, Tex., state that the San Antonio Telephone Company has in active operation about 1,500 instruments, and while the company has had to contend with serious difficulty in getting its material, which has ever since the company was organized failed to arrive on time, it has done the very best possible work under the circumstances and been indefatigable in its efforts to live up to its promises.

TYLER, TEX.—Tyler Telephone Company, of Tyler; capital stock, $40,000. Incorporated by S. F. Richardson, Z. B. Campbell, of San Antonio; M. D. Shaw, of Wapakoneta, Ohio; J. W. Wright, of Tyler; James S. Burling, of Wauseon, Ohio; James King Duffy, of New York city. S. F. Richardson, president; M. D. Shaw, secretary, and J. W. Wright, treasurer. The city council granted a franchise to the Tyler Telephone Company to put in a system of 'phones. S. F. Richardson has arrived from San Antonio and will immediately begin the work of putting in the new line. This is the same company which has recently put in a system at

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San Antonio and Austin. The franchise stipulates that the new company can not charge more than $3 for business and $2 for residence 'phones.

WAXAHACHIE, TEX.—A local telephone company to connect the towns of Ray, Howard, Nash, Maloney and Avaton with Waxahachie was organized here recently. The name is the Ellis County Telephone Company, and the capital stock is fixed at $2,000.

WICHITA FALLS, TEX.—The Wichita Falls Telephone Company, by changing its name to the Wichita Falls & Vernon Telephone Company.

WHITNEY, TEX.—The petition of E. K. McMahan to erect a telephone line at Whitney was granted.

WISCONSIN.

BLOOMER, WIS.—The Bloomer Telephone Company organized and elected the following officers: President, A. T. Newman; vice-president, William Newton; secretary, H. Lebeis, Jr.; treasurer, W. E. Kitch.

BRUCE, WIS.—A telephone company has been organized in Chippewa county to be known as the Chippewa Valley Telephone Company. The John Arpin Lumber Company will control about seven hundred and fifty shares of the stock and the headquarters of the new company will be at Bruce. The line will be sixty miles in length and have about twelve stations. The company will have connections with the Baring County Telephone Company.

CHILTON, WIS.—The Eastern Wisconsin Telephone Company has recently taken charge of the local line and installed a complete new system. Over fifty 'phones are in operation.

CASCO, WIS.—Articles of incorporation were filed by the Casco & Brussels Telephone Company, the incorporators being P. R. Minahan, of Casco, and Frank Pierre, Frank Quartemont and D. J. Bondhuin, of Brussels. The capital stock of the new company is $400.

FORT ATKINSON, WIS.—A meeting of the Jefferson County Telephone Company was held, and the proposition to increase the capital stock to $8,000 was voted.

MONDOVI, WIS.—Last week the Osseo Telephone Company made a deal whereby it became possessor of the independent local exchange at Mondovi, having purchased the same from Paul Huefner, of Fountain City.

MADISON, WIS.—Fire caused $20,000 damage to the Standard Telephone manufacturing plant, all but $5,000 being on stock and machinery. Insurance covers the loss. Business will not be interrupted.

P. L. Spooner, brother of the United States senator, and Horace A. Taylor, fifth assistant secretary of the treasury, are the chief owners of the property.

MILWAUKEE, WIS.—Invasion of the local telephone field is contemplated by the Kurtz National Telephone Company, which filed articles of incorporation. The promoter of the company, W. J. Kurtz, has been in the city for some time. He has installed systems at Minneapolis, Kenosha, and recently at Pewaukee and the lake resorts. The company is formed with J. W. Murphy, a well-known politician and lumber dealer; J. W. Clarke, an attorney, and P. J. Schmidt, as incorporators. The capital stock is $25,000.

The articles state that the business of the company will be the construction and operation of telephone and telegraph lines and manufacture of telephones and electrical appliances.

MARSHFIELD, WIS.—The Badger Telephone Company has obtained control of the Marshfield-Greenwood line, which will hereafter be operated as a part of its system. Manager Heath contemplates improvements and additions which will make his system practically cover the county.

PORTER, WIS.—The Farmers' Telephone Company, with a capital stock of $2,100, was incorporated. The incorporators are George Lyntz, Jos. Gibbs, W. H. Mosher and L. H. Towne, of Edgerton.

WEST SUPERIOR, WIS.—The Peoples' Telephone Company, of West Superior, Wis., will construct toll lines to Carlton and Cloquet, Minn., and towns on the Iron Range. This will give the new company quite a lead over the old Bell Company, as the new company has the only connections with the county offices. The Zenith City Telephone Company, of Duluth, will form a local company at Cloquet, and have work started immediately on a local exchange. This company works in unison with the Peoples' Company, of Superior, both being under the same control.

VIRGINIAS.

BRILLIANT, W. VA.—Town council has given the Phœnix Telephone Company a franchise to erect a telephone line.

CHARLOTTSVILLE, W. VA.—M. C. Watts, general manager and superintendent of the long-distance telephone system in Virginia, is quoted as saying that the system is now about two-thirds completed. Charlottsville, Richmond, Lexington, Staunton and other cities have been connected. Other connections will be completed about July 1.

HINTON, W. VA.—Mr. B. F. Mann, trustee, on April 24 bought the entire equipment and franchises of the Hinton & Southeastern Telephone Company, paying therefor $7,000. He recently purchased the Hinton Consolidated for $4,200, and this last acquisition seems to give the Greenbrier & Or. Cave Telephone Company control of all the telephone lines (with the exception of the Greenville Company) in this section of the State from Marlinton to Beckley and Bluefield. The two Hinton companies will be consolidated under the name of the West Virginia Telegraph & Telephone Company, for the purpose of purchasing, constructing and operating telegraph and telephone lines in the United States, etc. Principal office, Hin-

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ton, W. Va. Total authorized capital, $50,000. Shares, $10. Capital subscribed and paid in, $10,000. Incorporators: B. F. Mann, Fort Spring, W. Va.; J. A. Parker, John D. Sweeney, James H. Miller, James H. George, R. F. Dunlap, A. G. Flannagan, Hinton, W. Va.

HAMPTON, VA.—The Long-Distance Telephone Company of Virginia recently purchased the plant of the Hampton Telephone Company, which is made up of local business men.

KEYSER, W. VA.—C. J. Webb has leased the old Gordon Telephone Line, and is installing a new system in town.

NEWPORT NEWS, VA.—President Isaac Witz and general manager N. C. Watts, of the Long-Distance Telephone Company of Virginia, as a result of conferences with the stockholders of the Hampton Telephone Company, has bought out the latter.

The Newport News and Richmond and the Chesapeake Telephone Companies have consolidated.

SPOTTSYLVANIA, VA.—Spottsylvania Telephone Company will extend its lines to Belmont and Chilesburg.

WHEELING, W. VA.—The National Telephone Company, of Wheeling, W. Va., has placed on record a deed of trust for $100,000 to cover the bonds which it will issue.

WASHINGTON.

EVERETT, WASH.—An ordinance was passed granting to James E. Bell, president of the Bell-Nelson Mill Company, the franchise to construct an underground telegraph and telephone system and to maintain the same for a period of fifty years.

SEATTLE, WASH.—F. C. Pasak is to have charge of the installation of the plant of the Automatic Telephone Company in Seattle, Wash. Mr. Pasak says that by June 27, 360 telephones will be in operation. Underground cables will be laid thruout the business part of the city.

WHATCOM, WASH.—F. B. Ingersoll, of Seattle, applied to the city council for a franchise for an independent telephone system. Mr. Ingersoll represents the same people who put in the automatic system in Seattle, and proposes to put the same kind of a system in here if granted a franchise.

OTHER STATES.

PORTLAND, ORE.—The Columbia Telephone Company, of Portland, has extended its lines to Sellwood, Oregon, and to Mount Scott. An extension to Forest Grove is projected. There is also talk of building a long-distance line to connect Portland with the lines of the new independent telephone company in Seattle, Wash.

MANCHESTER, N. H.—The affairs of the Manchester, N. H., Telephone Company, which were thought to be about ready for final settlement, are still unsettled and probably will be for some time to come. By order of Judge Wallace, in the Superior Court, the report of the commissioner appointed by the court to fix claims against the company's estate was recommitted to have additional facts found.

VINITA, I. T.—The Indian Telephone Company has increased its capital stock to $25,000, fully paid. The name of the company has been changed to the Indian Territory Telephone Company, under which name a charter has been applied for under the new law. The same officers and directors were reëlected.

CANTON BEND, ALA.—R. E. McWilliams is busy putting in a telephone system that will connect Canton Bend and Rock West with Camden, Ala., and it is not improbable that in the near future he will extend his lines to more distant points in Wilcox county. This new enterprise will prove a great convenience, both to Camden and the surrounding towns.

MUSKOGEE, I. T.—The Indianola Telephone & Telegraph Company was organized at this place with a capital stock of $200,000, paid up, with C. N. Haskell, president, and W. T. Hutchings, of this place, secretary and treasurer. Messrs. Walter P. Richie and O'Kell make up the rest of the company. The object of the company is to build to lines connected with Southern States. This company is largely capitalized and will no doubt do much construction within the next two years.

PONCA CITY, OK.—A charter has been granted to the Osage & Eastern Oklahoma Telephone Company. The purpose of the company is to construct and operate telephone lines in Oklahoma, also in the Osage and Kaw Indian reservations. The principal place of business is Ponca City and the capital stock is $100,000. The incorporators are James H. Clapp, president, and D. Lafe Hubler, treasurer, of Ponca City, and Otto A. Elliott, secretary, of Newkirk.

BILLINGS, MONT.—E. M. Hungerford has resigned as superintendent of the Billings Telephone Company and has been succeeded by L. H. Stoddard. Mr. Hungerford intends to remain in the telephone business in Billings and will ask the city council for a franchise to operate a local exchange, having received the necessary support of local capital for carrying on another system.

PORTLAND, ORE.—Messrs. A. E. Adams, Jules Voutrout, Jr., of this city; C. B. Shelby, of Warren, and S. B. Claypool, formerly of this city, but now located at Seattle, have secured an option on the properties of the Columbia Telephone Company, of Portland, Ore. The gentlemen mentioned propose to build an exchange at Tacoma and consolidate with the Portland and Seattle companies, which are already built. The consolidated company will have a capital stock of $1,000,000.

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DIGEST OF TELEPHONE PATENTS (Illustrated)
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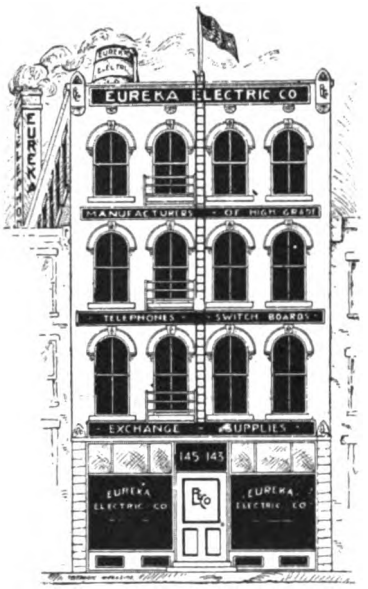

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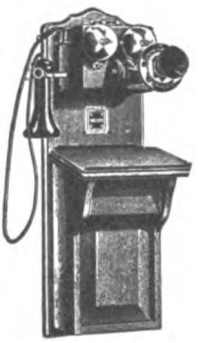

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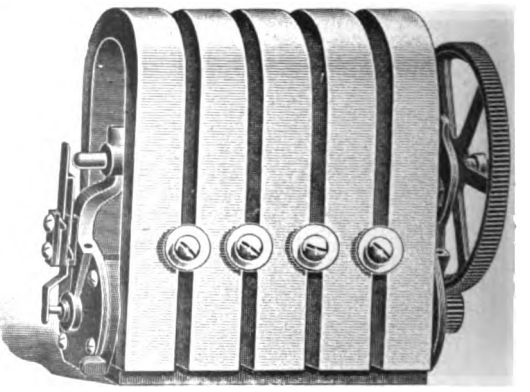

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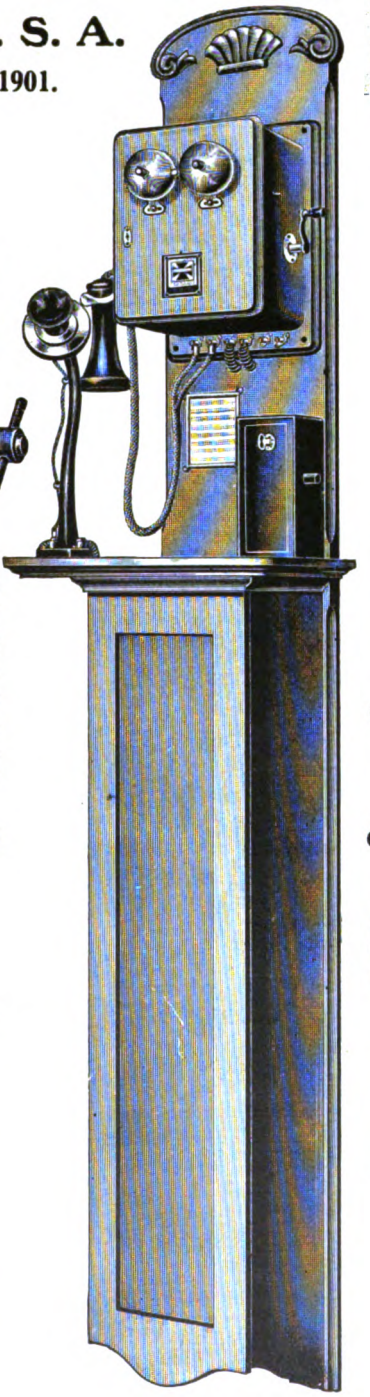

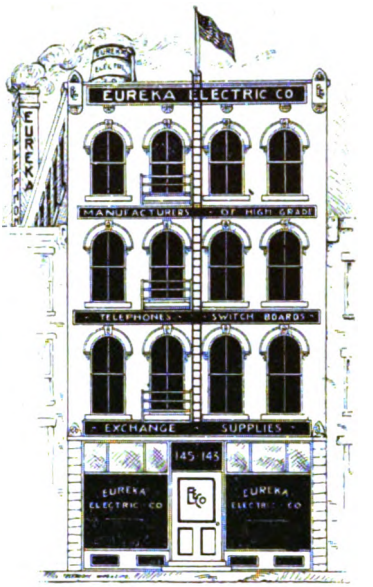

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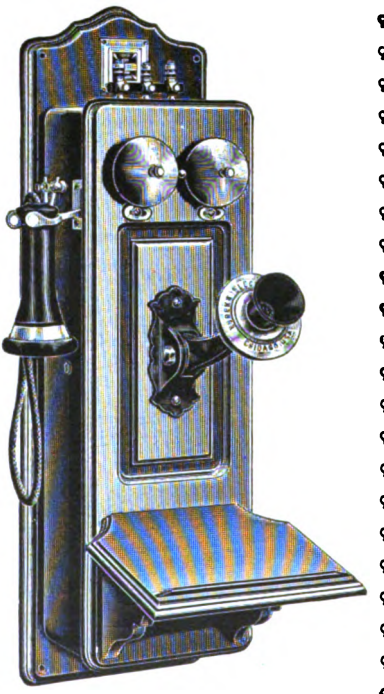

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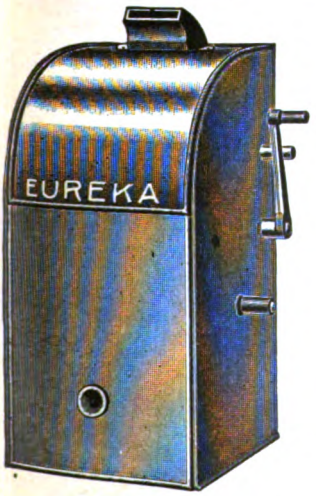

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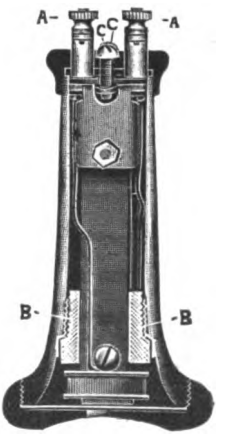

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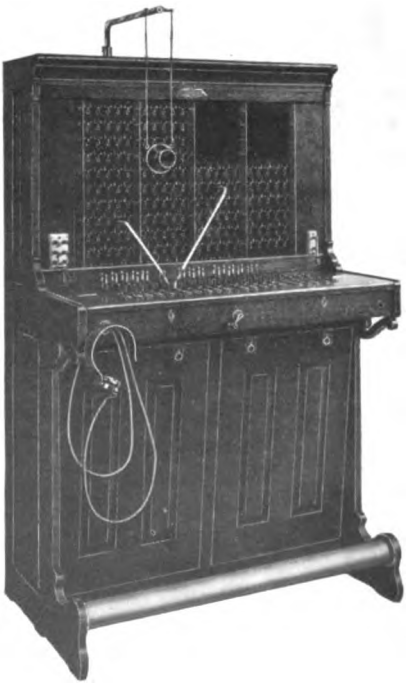

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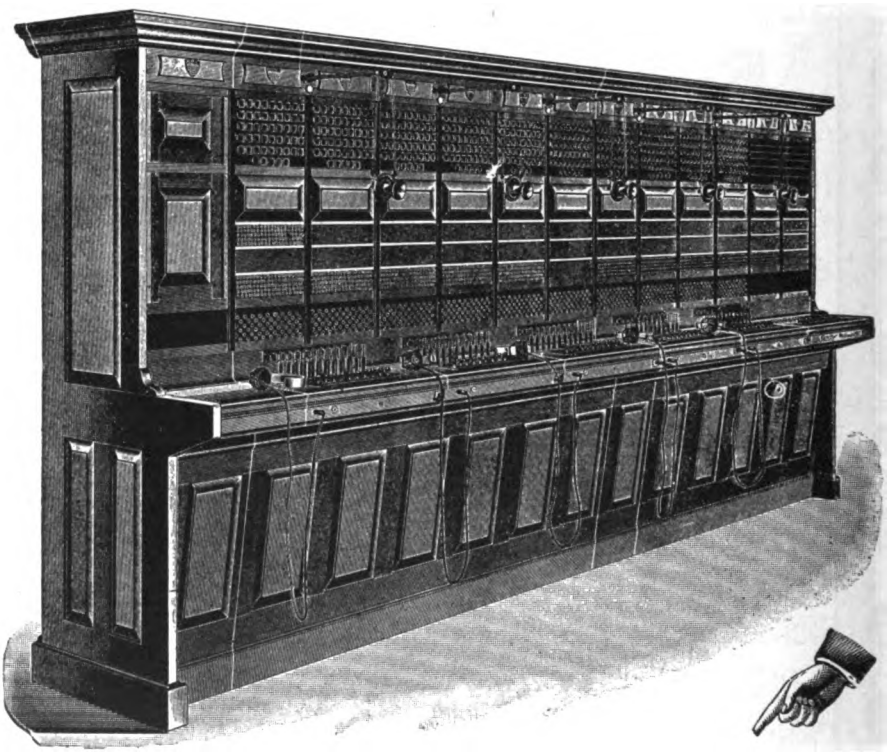

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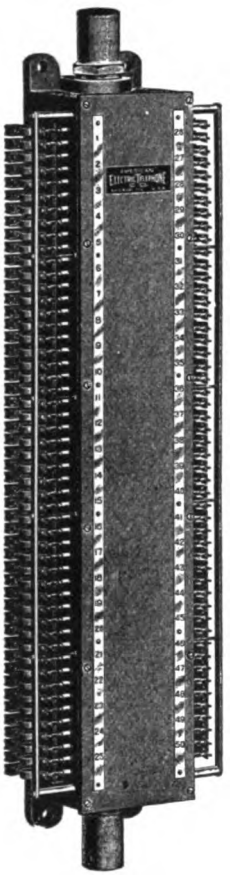

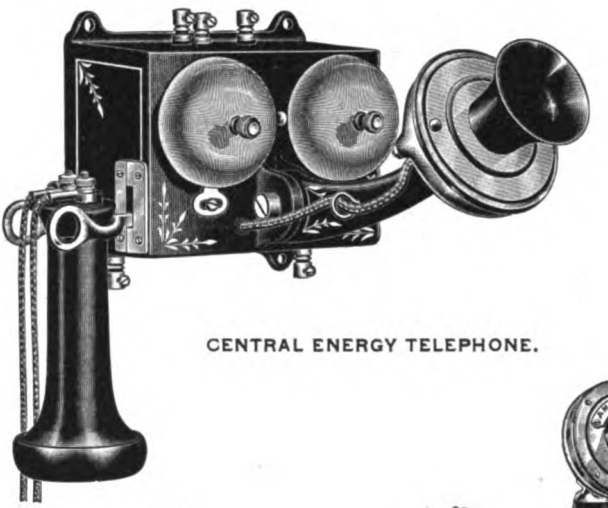

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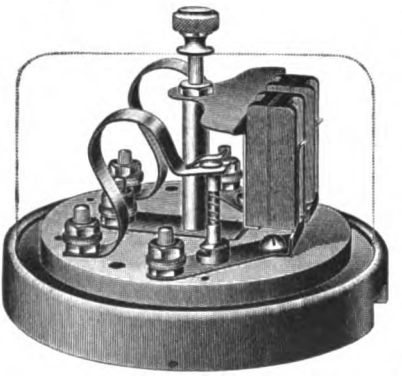

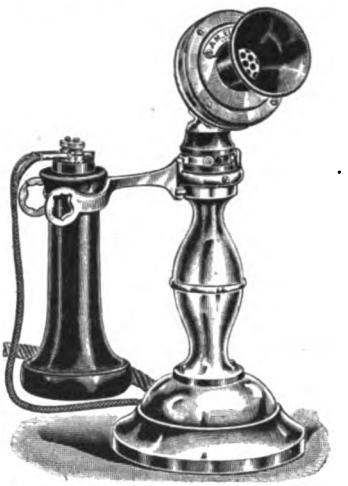

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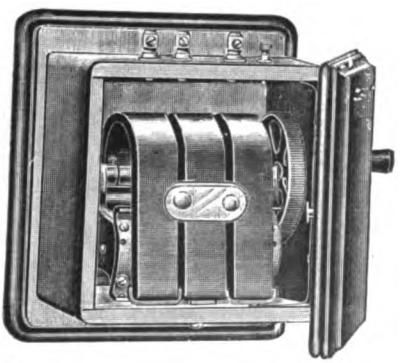

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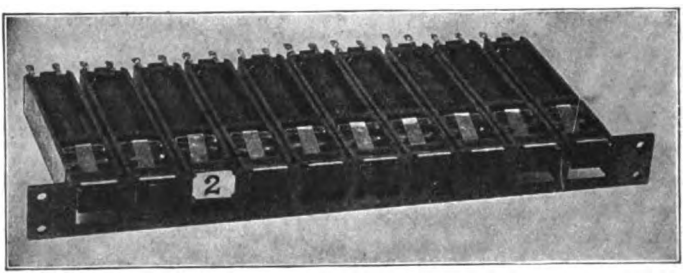

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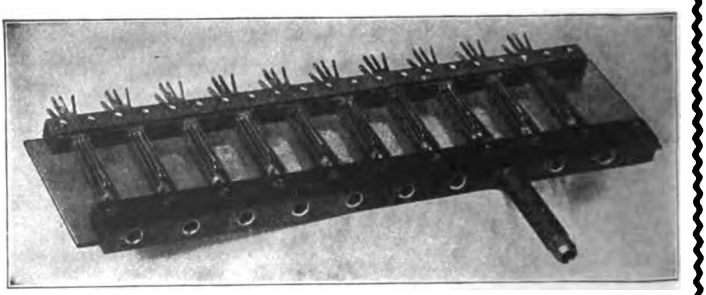

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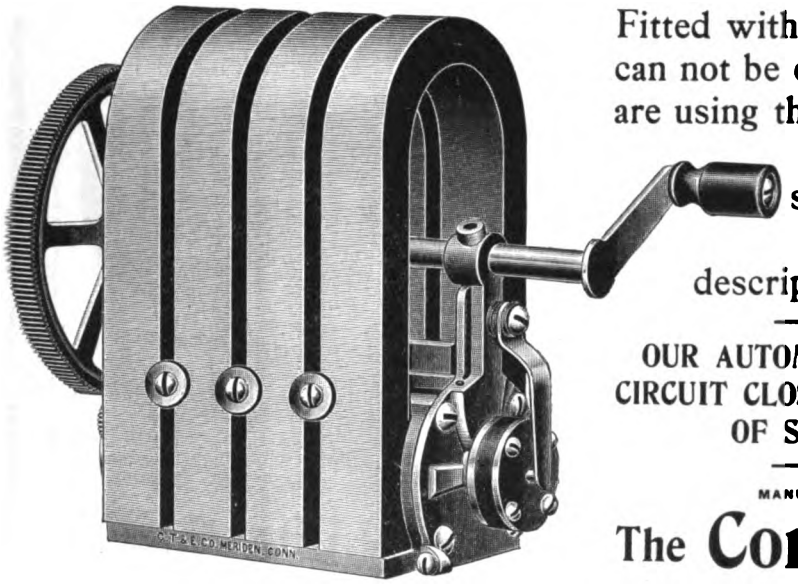

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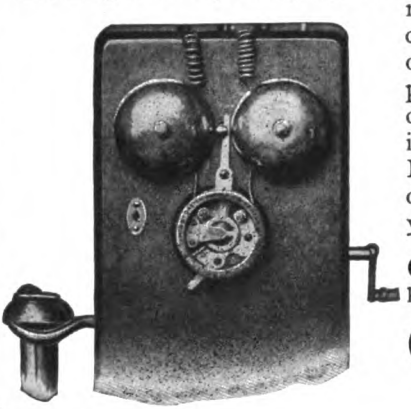

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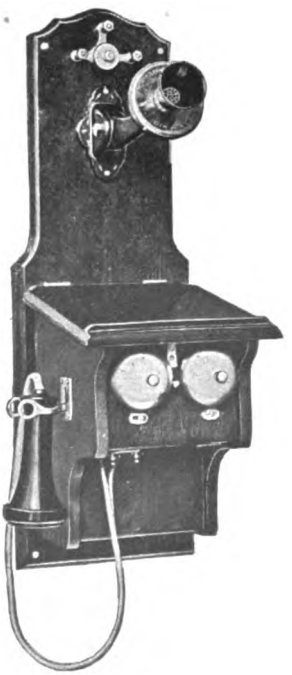

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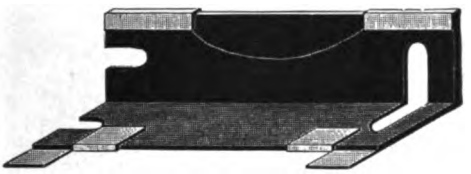

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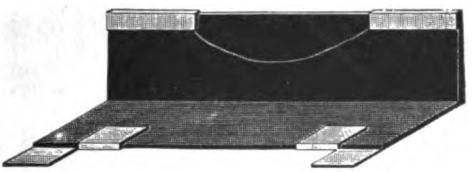

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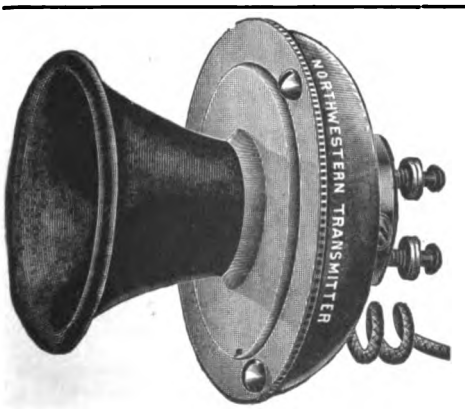

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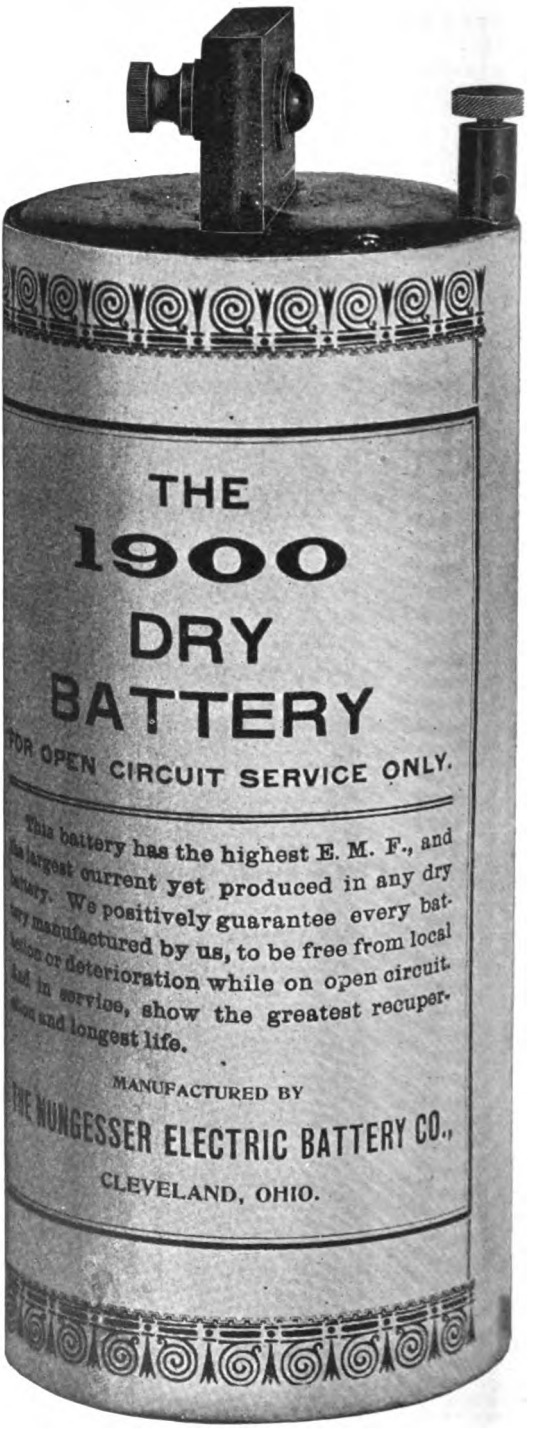
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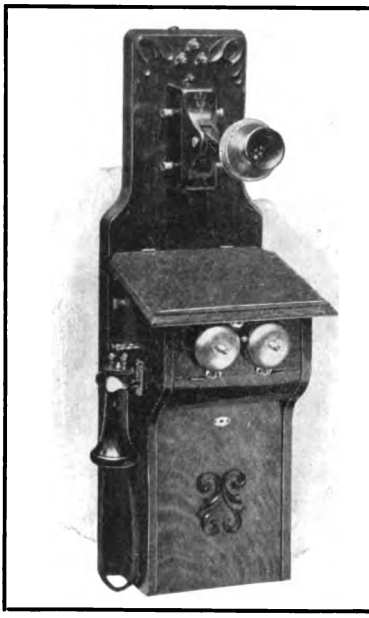

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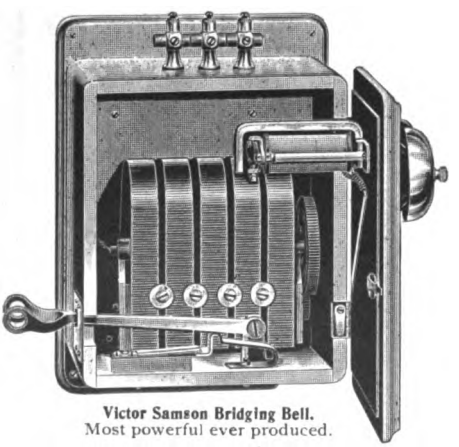

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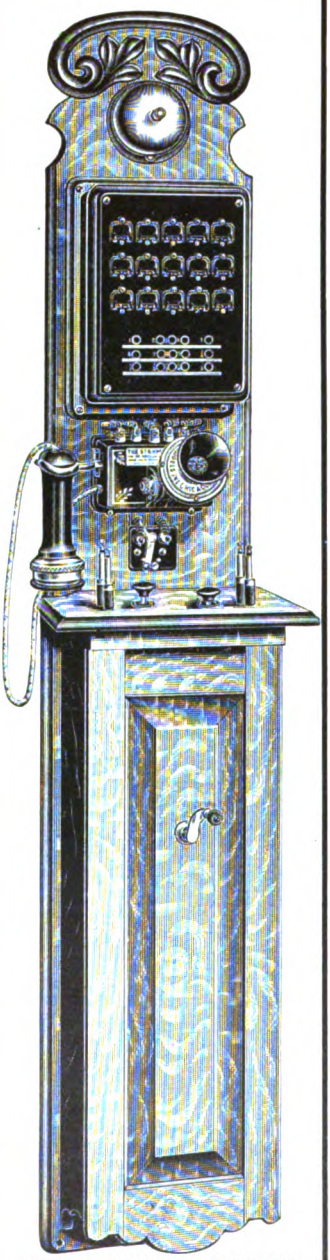

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